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Inventory of U.S. Exploratory Longline Fishing Effort and Catch Rates for Tunas and Swordfish in the Northwestern Atlantic, 1957-65

By Peter C. Wilson and Martin R. Bartlett

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By

PETER C. WILSON and MARTIN R. BARTLETT

Contribution No. 1698, Woods Hole Oceanographic Institution
Woods Hole, Mass.

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Inventory of U.S. Exploratory Longline Fishing Effort and Catch Rates for Tunas and Swordfish in the Northwestern Atlantic, 1957-65

By

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ABSTRACT

This report summarizes the results of longline explorations for tunas and swordfish by the Bureau of Commercial Fisheries and the Woods Hole Oceanographic Institution in the Northwestern Atlantic from March 1957 to June 1965. Fishing log data from 31 exploratory cruises are summarized in 12 monthly tables that give the date, time, position, number of hooks fished and catch for each longline set. The total and monthly fishing effort (number of longline sets and hooks fished within each 1° latitude and longitude square) is shown by 13 figures. Similar figures show the total and monthly average and maximum number of bluefin, yellowfin, albacore, and bigeye tunas, and swordfish caught per 100 hooks within each 1° square. Two figures show the monthly catch rates for blackfin and skipjack tunas by 1° squares.

INTRODUCTION

Tunas and swordfish have been under investigation[1] in the Northwestern Atlantic by two U.S. research agencies to determine the distribution, abundance, migration, and availability of several species.[2] A major aim of the BCF (Bureau of Commercial Fisheries) Exploratory Fishing Base, Gloucester, Mass.,[3] has been the assessment of this resource in oceanic waters off the east coast of the United States to provide long-range supporting knowledge necessary for the development of Atlantic coast tuna and swordfish fisheries. WHOI (Woods Hole Oceanographic Institution) has studied the life histories of these species, with particular emphasis on bluefin tuna. The agencies have coordinated efforts and aims through joint cruises and exchange of equipment, personnel, and data.

Between March 1957 and June 1965, the Bureau's research vessel Delaware, various WHOI research vessels, and chartered or cooperatively engaged vessels made 31 exploratory fishing cruises in the North Atlantic Ocean and Caribbean Sea to explore the distribution and abundance of tuna and swordfish (table 1). This report covers the portions of the explorations within the area of the Northwestern Atlantic bounded on the northwest by the 100-fath. (fathom) contour of the North American Continental Shelf, on the south by lat. 35° N., and on the east by long. 49° W. (fig. 1). Many of these cruises have been reported individually (Bureau of Commercial Fisheries, 1957a, 1957b, 1958a, 1958b, 1958c, 1959a, 1959b, 1960, 1962, 1963, 1964a, 1964b, 1965b, 1965d; Mather and Bartlett, 1962). Tuna distribution data from Delaware cruises through 1960 have been summarized by Squire (1962b), and extracted data from these cruises and other sources have been treated by Mather (1962, 1964) and Squire and Mather (1963). Incidental captures of swordfish were reported by Mather and Bartlett (1962) and Squire (1962a).

[1] Swordfish explorations began in 1961.

[2] Bluefin tuna (Thunnus thynnus), yellowfin tuna (T. albacares), albacore (T. alalunga), bigeye tuna (T. obesus), blackfin tuna (T. atlanticus), skipjack tuna (Euthynnus pelamis), and swordfish (Xiphias gladius).

[3] Located at East Boston, Mass., 1954-59.

Table 1.--Periods, vessels, and cruises included in this inventory

Period		Vessel	Cruise No.	Agency[1]
1957:	Mar.-Apr.	Delaware	57-3	BCF
	June-July	Delaware	57-5	BCF
	Sept.-Oct.	Delaware	57-8	BCF
1958:	Apr.-May	Delaware	58-2	BCF
	July-Aug.	Delaware	58-3	BCF
1959:	Jan.-Feb.	Delaware	59-1	BCF
	May	Delaware	59-6	BCF
	June	Golden Eagle	1	BCF
1960:	Apr.-May	Delaware	60-6	BCF
	Nov.	Crawford	56	WHOI
1961:	Apr.-June	Crawford	62	WHOI
	July	Eugenie VIII	5	WHOI
	Aug.	Bear	265	WHOI
	Sept.-Oct.	Eugenie VIII	12	WHOI
	Oct.	Cap'n Bill III	61-1	WHOI
	Oct.	Cap'n Bill III	61-2	WHOI
	Nov.	Eugenie VIII	14	WHOI
1962:	Oct.	Cap'n Bill III	62-1	WHOI
	Oct.	Cap'n Bill III	62-2	WHOI
	Nov.	Cap'n Bill III	62-3	WHOI
	Nov.-Dec.	Cap'n Bill III	62-4	WHOI
	Dec.	Cap'n Bill III	62-5	WHOI
1963:	Jan.	Gosnold	6	WHOI
	Apr.-June	Delaware	63-4	BCF, WHOI, NGS
	Nov.-Dec.	Delaware	63-11	BCF
1964:	Apr.-June	Delaware	64-3	BCF
	May	Cap'n Bill III	64-1	WHOI
	Oct.	Delaware	64-10	BCF
1965:	Jan.	Delaware	65-1	BCF
	Apr.	Delaware	65-3	BCF
	May	Cap'n Bill III	65-1	WHOI

[1] Agency abbreviations: BCF - Bureau of Commercial Fisheries, WHOI - Woods Hole Oceanographic Institution, NGS - National Geographic Society.

Generally the presence of tunas is detected directly (sighting the fish) or indirectly (bird flocks, favorable environmental conditions, test fishing). Sight has been used successfully on the Continental Shelf off the northeast coast of the United States and has figured largely in the development of the Atlantic coast tuna fishery (Murray, 1952, 1955; Wilson, 1965); indirect methods, with gill nets, trammel nets, and longlines, in this area have not been as productive (Murray, 1953, 1954). Conversely, sighting of tuna beyond the 100-fath. curve of the Northwestern Atlantic Continental Shelf has been less successful than the indirect method of using longlines to sample subsurface waters (Bureau of Commercial Fisheries, 1956; Squire, 1962b). Very few surface schools of tuna or bird flocks have been observed during these investigations.

Until 1962 the fishery for swordfish in the Northwestern Atlantic was seasonal (June to September), executed with harpoon, confined to waters over the Continental Shelf, and limited to visual detection of fish at or immediately below the surface. During these explorations considerable numbers of swordfish were taken with longline gear at night. Subsequently, the swordfish fishery has become principally a longline effort undertaken over a much larger area on a 12-month production basis. Since June 1961 nighttime longline explorations have been emphasized to determine the distribution, abundance, migration, and availability of swordfish.

This report summarizes all longline explorations for tuna and swordfish accomplished by BCF and WHOI, some previously unreported, within the prescribed area between March 1957 and June 1965. It is within this area of the Northwestern Atlantic that most of the effort has been expended. Other longline sets (south and east of the area) made during some of these cruises (Bureau of Commercial Fisheries, 1957a, 1957b, 1958a, 1958c, 1962, 1963, 1965d) and other exploratory longline cruises (south of the area) by WHOI and other agencies (Anonymous, 1960; Bureau of Commercial Fisheries, 1961, 1962, 1965a, 1965c, 1965e; Tibbo, Lauzier, and Kohler, 1965) are not included in this report.

These investigations surveyed the distribution and abundance of tunas and swordfish over a large sector of the western North Atlantic; they did not focus entirely on the commercial availability or vulnerability of the species. The resulting effort and catch rates from these explorations should not be misconstrued as a singular basis for projection of commercial potentials.

FISHING METHODS

Longline gear used on cruises between 1957 and January 1963 (table 1) was essentially the same as Japanese gear described in detail by Shapiro (1950), and modified by the Fish and Wildlife Service's Pacific Oceanic Fishery Investigations (Niska, 1953) and the Bureau's Exploratory Fishing and Gear Research Base, Pascagoula, Miss. (Captiva, 1955). The basic unit of longline gear, a "basket" (tub), contained 138 fath. of nylon mainline and ten 5-fath. branchlines (gangions) coiled in a galvanized tub. A commercial Japanese longline hauler was used to retrieve the gear. During Delaware cruises 63-4, 63-11, and 64-3 a 160-fath. manryo[4] mainline and seven 5-fath. branchlines were used. A further modification on Delaware cruises 64-10, 65-1, and 65-3 eliminated the "basket" and Japanese hauler and provided a continuous manryo mainline with 220-fath. units of eleven 20-fath. sections, spooled on a hydraulically powered reel. Ten 5-fath. branchlines were attached to each unit during setout, and removed during haulback. On Cap'n Bill III cruises 64-1 and 65-1, a 165-fath. mainline of polypropylene, with ten 1-fath. branchlines, was substituted for the original nylon gear.

The subsurface (vertical) area sampled in these explorations was within the upper 150 fath. Depth at which the gear was fished was

[4] Manryo (kuralon) is the trade name for synthetic fibers made of polyvinyl alcohol. The material has replaced cotton used for longlines in the Japanese fishery. The trade name manryo referred to in this publication does not imply commercial endorsement of the product.

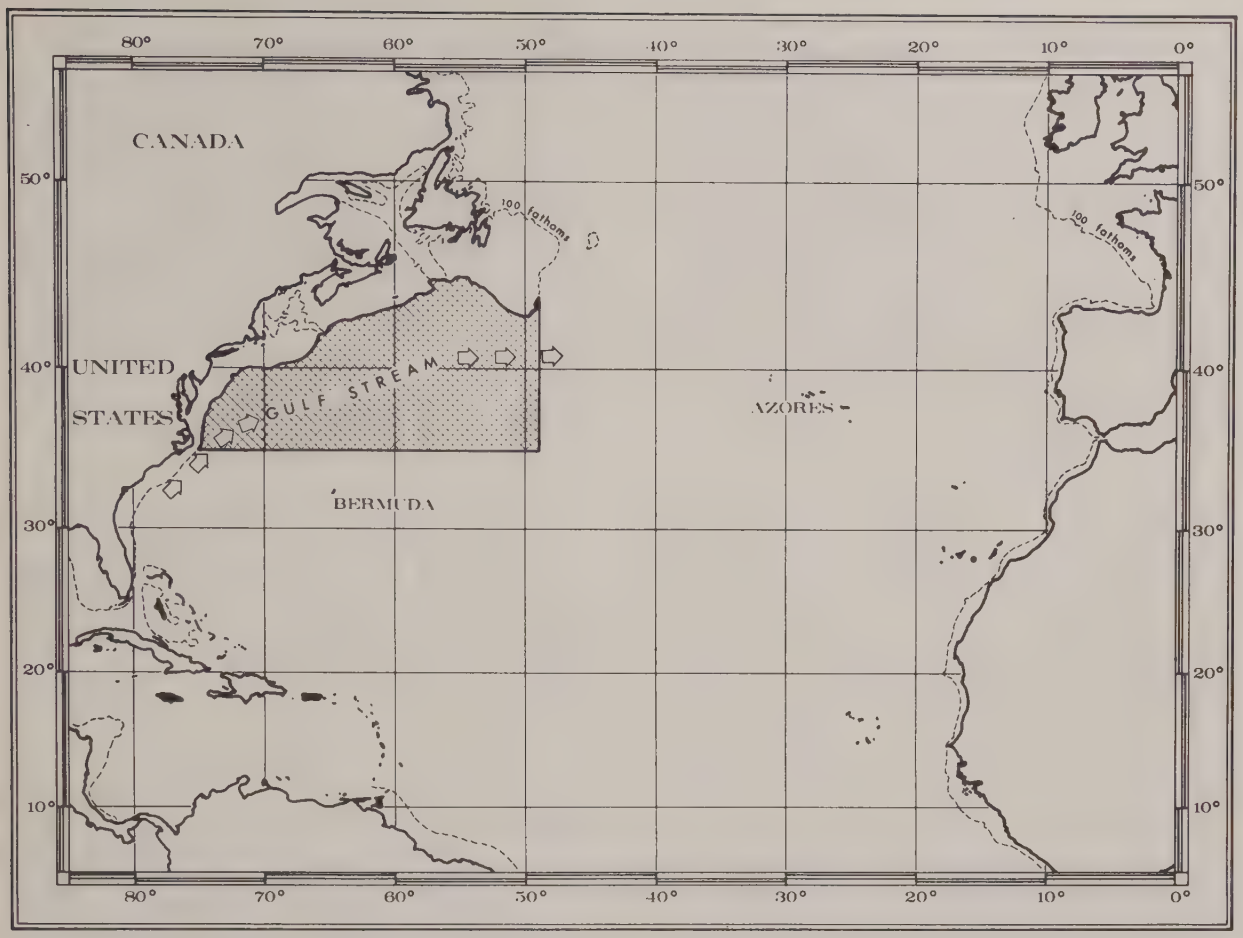

Figure 1.--Shaded portion of North Atlantic is the area of tuna and swordfish explorations covered by this inventory.

regulated by the number of buoys and length of buoylines supporting the mainline units. Most longline sets were buoyed at the ends of each unit with buoylines, which varied on different cruises and sets from 5 to 30 fath. For swordfish explorations some of the gear was fished over a wide depth range, with buoys, and 1-fath. buoylines at every second, and sometimes third, unit (Cap'n Bill III cruises 64-1 and 65-1). On other occasions fishing depth distribution was attained by using several different buoyline lengths on the same set. Analyses of the depth distribution of the catch should not be derived from the information presented in this report because these variations and other factors (current, speed and direction) caused uncertainty in the estimated fishing depths of the gear.

The time period during which longline gear was fished (table 2-13) has varied considerably during these investigations. Until June 1961 (Crawford cruise 62), all longline sets were specifically made for tuna and were fished during daylight. Setout generally commenced at or shortly after dawn, and hauling was completed well before dusk. Since June 1961 a large number of the longline sets have been set out at dusk or after dark for swordfish and were not hauled until dawn of the following day. In some instances when hauling continued well into daylight, the gear took good catches of tuna.

Principal bait used on most sets has been Atlantic herring (Clupea harengus harengus). Other baits used in combination with Atlantic herring, with other species, or separately included: alewife (Alosa pseudoharengus), silver hake or whiting (Merluccius bilinearis), squirrel hake or red hake (Urophycis chuss), blue runner or hardtail (Caranx crysos), scup (Stenotomus chrysops), Atlantic mackerel (Scomber scombrus), ocean pout or eelpout (Macrozoarces americanus), butterfish (Poronotus triacanthus), common squid (Loligo pealii) and flying squid (Ommastrephes illecebrosa). Most bait was frozen, but occasionally fresh bait was obtained from midwater or bottom trawl drags over the Continental Shelf.

Major consideration was given to spatial and temporal coverage on the explorations. Equal importance was assigned to environmental features that could be measured or observed and that are known to be related to

pelagic fish distribution and abundance. Most obvious of these is the track of the Gulf Stream through the area (fig. 1), with associated thermal gradients and related structures along its frontal zone (von Arx, Bumpus, and Richardson, 1955). Surface and subsurface temperature observations, and more recently (Delaware cruises 64-10, 65-1, 65-3) synoptically charted surface temperature data received by vessel radiofacsimile equipment, have been fundamental criteria in determining where to set longlines. Other environmental information collected and used on some of these cruises has included determinations of current (drift), transparency, salinity, and abundance of trophic organisms.

EFFORT

The total effort expended is shown by the number of longline sets and hooks fished within each 1° latitude and longitude square (fig. 2) and indicates the relative amount of coverage in the various sections of the area surveyed. The monthly effort, based on the number of longline sets and hooks fished within each 1° square, is given in fig. 3-14.

In almost all instances the effort reflects exploratory fishing methods, in which sampling type gear was used from a single vessel. Owing to the vessel's research commitments, cruise schedules could not be altered to make up for time lost because of bad weather. To obtain geographic coverage, stations were generally spaced at considerable distances from one another; seldom was more than a single day's effort spent at one location. Commercial fishing efforts would likely include more than one vessel, concentrate on most productive areas, adjust trips to weather, and use gear and methods designed to catch one or a few species at a time.

CATCH RATES

Catch rates are based on the number of fish caught per 100 hooks fished. The total and monthly average and maximum catch rates of all longline sets for bluefin, yellowfin, albacore, and bigeye tunas, and swordfish are broken down into 1° latitude and longitude squares (fig. 15-66 and 69-81). The monthly catch rates of skipjack and blackfin tunas are given in fig. 67 and 68. All catch rates have been rounded to one decimal place; rates less than 0.05 are noted by asterisk.

Where average and maximum rates are the same, generally only one longline set is indicated; however, because of exceptions the number of longline sets in each 1° square should be obtained by referring to the corresponding effort chart (fig. 2-14) in relating rate and effort.

All longline sets were used to calculate tuna and swordfish catch rates. Although catches of swordfish were almost entirely from longline sets fished during the night, some night sets fished into daylight and caught tuna, and some day sets also caught swordfish. Areas showing no catches of swordfish (fig. 69-81), therefore, do not necessarily indicate that there were no swordfish present, but more likely reflect "no catch" because of daylight fishing. To permit a more detailed analysis of day versus night sets, the fishing time for each longline set is included in the fishing log data (tables 2-13).

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Table 2.--Fishing log data for January

Year	Day	Vessel	Cruise No.	Station No.	Position		Time	Hooks	Bluefin	Yellowfin	Albacore	Bigeye	Skipjack	Blackfin	Swordfish
					Lat. N.	Long. W.	Start-End	No.	Number						
1959	14	Delaware	59-1	1	40°24'	66°42'	0645-1200	300	-	-	-	-	-	-	-
	15			2	38°55'	66°42'	0615-1230	450	15	-	5	-	-	-	-
	18			3	38°35'	68°14'	0630-1200	450	6	-	3	1	-	-	-
	21			4	38°16'	70°00'	0640-1230	450	25	-	1	1	-	-	-
	23			5	37°30'	71°33'	0645-1230	450	2	-	-	1	-	-	-
	24			6	36°15'	72°28'	0640-1400	600	-	7	-	-	-	-	-
	29			7	36°46'	70°00'	0615-1530	600	34	9	4	-	-	-	-
	30			8	37°03'	68°14'	0630-1230	480	2	1	-	-	-	-	-
1963	10	Gosnold	6	1	39°44'	71°17'	1200-1620	200	-	-	-	-	-	-	-
	11			2	39°11'	71°35'	0315-1110	450	2	-	-	1	-	-	-
	12			3	39°08'	72°32'	0625-1510	450	1	-	-	-	-	-	-
	13			4	37°56'	73°43'	0612-1515	480	-	-	4	-	-	-	-
	14			5	35°52'	73°47'	0640-1415	450	-	5	-	-	-	-	-
	15			6	35°58'	74°16'	0707-1520	460	-	-	-	-	-	-	1
	16			7	35°45'	74°46'	0720-1400	320	-	-	-	-	-	-	-
	20-22			8	36°56'	74°31'	2136-1620	530	-	-	2	-	-	-	7
	23			9	37°51'	73°29'	0645-1415	300	-	-	2	-	-	-	-
1965	26-27	Delaware	65-1	1	39°17'	65°34'	1845-0900	300	-	-	-	-	-	-	-

Table 3.--Fishing log data for February

Year	Day	Vessel	Cruise No.	Station No.	Position		Time	Hooks	Bluefin	Yellowfin	Albacore	Bigeye	Skipjack	Blackfin	Swordfish
					Lat. N.	Long. W.	Start-End	No.	Number						
1959	1	Delaware	59-1	9	37°24'	66°42'	0625-1215	450	4	1	1	-	-	-	-
	3			10	35°29'	68°45'	0620-1345	500	-	-	1	-	-	-	-
	5			11	39°45'	68°55'	0630-1230	410	-	-	2	-	-	-	-

Table 4.--Fishing log data for March

Year	Day	Vessel	Cruise No.	Station No.	Position		Time	Hooks	Bluefin	Yellowfin	Albacore	Bigeye	Skipjack	Blackfin	Swordfish
					Lat. N.	Long. W.	Start-End	No.	Number						
1957	17	Delaware	57-3	1	39°48'	70°00'	0630-1115	240	1	-	-	-	-	-	-
	18			2	38°32'	70°00'	0615-1230	400	-	-	-	-	-	-	-
	19			3	36°40'	70°00'	0615-1230	300	13	5	2	-	-	-	-
	22			4	36°48'	74°00'	0630-1215	250	-	-	-	-	-	-	1

Table 5.--Fishing log data for April

Year	Day	Vessel	Cruise No.	Station No.	Position		Time	Hooks	Bluefin	Yellowfin	Albacore	Bigeye	Skipjack	Blackfin	Swordfish
					Lat. N.	Long. W.	Start-End	No.	Number						
1958	21	Delaware	58-2	1	41°09'	51°00'	0630-1400	600	16	-	-	-	-	-	-
	22			2	39°36'	51°00'	0615-1330	600	1	-	1	-	-	-	-
	23			3	39°20'	53°10'	0615-1330	600	-	-	-	-	-	-	-
	24			4	39°00'	55°20'	0615-1230	400	-	-	1	-	-	-	-
	25			5	40°32'	55°20'	0615-1330	600	7	-	-	-	-	-	-
	26			6	42°02'	55°20'	0615-1345	400	2	-	-	-	-	-	-
	27			7	41°46'	57°30'	0810-1530	420	-	-	1	-	-	-	-
1960	21	Delaware	60-6	1	35°00'	70°00'	0615-1245	600	-	1	-	-	-	-	-
	22			2	35°33'	71°43'	0615-1210	600	-	-	1	-	-	-	-
	23			3	36°07'	73°25'	0615-1415	600	-	85	-	-	-	-	-
	24			4	36°25'	74°21'	0610-1130	600	4	-	-	-	-	-	-
1961	20	Crawford	62	1	39°46'	69°00'	0550-1435	300	-	-	-	-	-	-	-
	21			2	38°14'	68°08'	0520-1350	440	2	-	-	-	-	-	-
	22			3	35°34'	67°44'	0510-1206	490	-	-	-	-	-	-	-
1963	27	Delaware	63-4	1	40°09'	49°54'	0645-1510	420	-	-	1	3	-	-	-
1964	19	Delaware	64-3	1	38°41'	67°37'	0730-1300	210	3	-	1	-	-	-	-
	19-20			2	38°08'	67°33'	2030-1055	210	6	-	2	-	-	-	1
	20			3	38°03'	67°06'	0625-1325	210	4	-	-	-	-	-	-
	21-22			4	36°32'	69°10'	2010-1015	210	-	1	-	-	-	-	5
	22			5	36°30'	69°16'	0620-1155	210	-	-	1	-	-	-	-
	23			6	38°05'	69°06'	0745-1240	210	1	2	1	-	-	-	-
	24			7	37°44'	70°08'	0630-1250	210	-	14	-	-	-	-	-
	24-25			8	37°02'	69°38'	2025-0840	210	-	-	-	-	-	-	1
	26-27			9	35°25'	71°29'	2010-0955	210	-	-	-	-	-	-	2
	27			10	35°16'	71°25'	0620-1140	210	-	1	-	-	-	-	-
	28			11	36°00'	74°05'	0625-1350	420	-	29	-	-	-	-	-
1965	1	Delaware	65-3	1	35°54'	72°51'	0650-1800	600	15	-	2	-	-	-	-
	4			2	35°33'	74°12'	0630-1425	400	13	-	-	-	-	-	-
	6			6	35°32'	73°15'	0625-1458	600	7	10	-	-	-	-	-
	7			7	35°18'	74°21'	0625-1425	400	-	-	-	-	-	-	-
	8			8	35°56'	72°32'	0630-1535	600	19	5	2	-	1	-	-
	15			9	36°29'	70°58'	0635-1615	600	1	23	-	-	1	-	-
	17-18			10	38°09'	66°23'	1945-1255	300	-	1	1	-	-	-	1
	18			11	38°37'	66°02'	0625-1545	300	-	-	3	1	-	-	-

Table 6.--Fishing log data for May

Year	Day	Vessel	Cruise No.	Station No.	Position		Time	Hooks	Bluefin	Yellowfin	Albacore	Bigeye	Skipjack	Blackfin	Swordfish
					Lat. N.	Long. W.	Start-End	No.	Number						
1958	5	Delaware	58-2	8	38°26'	59°40'	0615-1515	600	79	3	-	-	1	-	-
	6			9	38°08'	61°50'	0615-1200	400	-	-	-	-	-	-	-
	7			10	39°40'	61°50'	0615-1330	600	3	-	2	-	-	-	-
	10			11	39°14'	58°14'	0615-1230	600	11	-	1	-	-	-	-
	11			12	41°10'	61°50'	0615-1400	600	73	-	-	-	-	-	-
1959	20	Delaware	59-6	1	38°48'	68°32'	0600-1430	600	83	-	-	1	-	-	-
	21			2	38°49'	68°00'	0600-1315	600	12	-	1	-	-	-	-
	22			3	38°26'	68°15'	0600-1400	600	53	-	-	-	-	-	-
	23			4	38°06'	68°16'	0615-1245	400	-	13	1	1	-	-	-
	24			5	38°37'	68°24'	0615-1545	600	125	-	-	-	-	-	-
	25			6	38°37'	68°24'	0600-1430	400	54	-	-	-	-	-	-
	26			7	38°38'	68°50'	0615-1530	600	123	-	-	-	-	-	-
1960	1	Delaware	60-6	5	37°58'	68°06'	0630-1230	400	-	6	-	-	-	-	-
	2			6	38°00'	65°25'	0620-0945	200	1	4	-	-	-	-	-
	4			7	40°28'	62°29'	0620-1330	600	3	4	-	-	-	-	-
	5			8	41°34'	63°50'	0615-1345	600	21	-	-	-	-	-	-
1964	17	Cap'n Bill III	64-1	1	38°22'	69°35'	1230-1745	450	-	3	-	-	-	-	-
	18			2	38°09'	69°01'	0310-0850	500	1	1	-	2	-	-	2
	19			3	38°08'	71°21'	0305-0840	500	-	-	-	-	-	-	-
	20			4	36°47'	73°31'	0255-0910	500	1	-	-	2	-	-	1
	22			6	35°03'	74°54'	1220-1710	400	1	3	-	-	-	-	-
	23			7	36°25'	73°55'	0248-0905	500	-	3	-	2	-	-	-
	24			8	38°06'	68°39'	0350-1040	500	-	4	-	-	-	-	-
	24-25			9	38°32'	69°38'	2110-1315	910	3	-	-	6	-	-	18
	25-26			10	38°29'	69°19'	2000-1150	910	5	-	-	5	-	-	13
	26-27			11	39°55'	69°01'	2310-0850	500	-	-	-	-	-	-	-
	27-28			12	39°50'	70°22'	2100-0710	350	1	-	-	-	-	-	-
1964	5	Delaware	64-3	14	36°25'	72°45'	0635-1105	140	1	2	-	-	-	-	-
	7-8			16	36°40'	69°42'	2130-1015	210	-	-	1	-	-	-	-
	8			17	36°41'	69°38'	0620-1255	210	-	2	1	-	-	-	-
	9			19	37°00'	68°46'	0630-1330	420	-	1	2	-	-	-	-
	10			21	38°03'	68°05'	0740-1245	280	-	5	-	-	-	-	-
	10-11			22	38°04'	68°01'	2115-0805	210	-	-	-	1	-	-	1
	13			24	36°13'	73°43'	0630-1315	280	1	4	-	-	-	-	-
	19			25	36°01'	74°16'	0715-1210	210	-	40	-	-	-	-	-
	20			26	36°49'	73°56'	0610-1230	280	-	-	-	3	-	-	-
	20-21			27	37°25'	73°09'	2135-0955	210	-	-	-	-	-	-	-
	21			28	37°23'	73°07'	0615-1120	210	-	-	-	-	-	-	-
	22			29	38°04'	70°45'	0605-1250	280	-	1	-	1	-	-	-
	22-23			30	38°31'	69°47'	2025-0805	210	-	-	-	-	-	-	4
	24			31	38°06'	67°49'	0650-1320	280	1	5	-	-	-	-	-
	25			32	38°55'	66°06'	0615-1320	280	-	-	-	-	-	-	-
	26			33	37°21'	65°14'	0635-1330	280	-	12	1	-	1	-	-
	26-27			34	37°50'	64°43'	2115-1005	210	-	7	-	1	-	-	-
	27			35	37°45'	64°22'	0620-1300	210	-	2	-	-	-	-	-
	28			36	39°30'	64°26'	0645-1325	280	-	16	1	-	-	-	-
	28-29			37	40°05'	65°07'	2110-0955	210	-	-	-	1	-	-	-
	29			38	40°16'	64°51'	0615-1315	210	-	3	-	4	-	-	-
	30			39	38°40'	66°59'	0745-1420	420	2	-	-	2	-	-	-
	30-31			40	38°38'	68°10'	2100-1010	210	1	-	-	2	-	-	-
	31			41	38°36'	68°08'	0615-1340	210	-	-	-	-	-	-	-
1965	8	Cap'n Bill III	65-1	1	35°39'	74°47'	0510-1125	390	-	-	-	-	-	-	-
	8-9			2	35°13'	74°38'	2050-1045	500	-	-	-	-	-	-	-
	9-10			3	36°33'	73°19'	2035-1035	670	-	-	-	-	-	-	2
	10-11			4	37°19'	71°28'	2000-1010	500	-	-	-	2	-	-	7
	12			5	38°20'	69°35'	0545-1050	480	-	-	-	-	-	-	-
	13			6	38°35'	66°30'	0355-1050	480	-	-	-	-	-	-	-
	13-14			7	39°28'	65°25'	2125-1020	510	1	-	-	-	-	-	3
	15			8	39°45'	69°39'	1140-1656	510	-	-	-	-	-	-	-

Table 7.--Fishing log data for June

Year	Day	Vessel	Cruise No.	Station No.	Position		Time	Hooks	Bluefin	Yellowfin	Albacore	Bigeye	Skipjack	Blackfin	Swordfish
					Lat. N.	Long. W.	Start-End	No.	Number						
1957	8	Delaware	57-5	1	40°26'	66°25'	0700-1130	250	11	-	1	-	-	-	-
	9			2	38°58'	66°26'	0645-1830	800	35	1	1	-	-	-	-
	10			3	37°45'	66°32'	0905-1330	250	-	5	-	-	-	-	-
	11			4	37°30'	68°10'	0705-1300	400	4	-	-	-	-	-	-
	12			5	38°35'	68°12'	0700-1600	600	7	23	-	-	-	-	-
	13			6	40°04'	68°12'	0735-1345	380	9	-	2	-	-	-	-
	14			7	39°48'	70°00'	0800-1215	400	7	-	1	-	-	-	-
	23			8	39°44'	71°23'	0745-1220	500	2	-	-	-	-	-	-
	24			9	38°46'	71°23'	0600-1330	600	-	-	1	-	-	-	-
	25			10	38°17'	70°00'	0630-1230	500	3	6	-	-	-	-	-
	26			11	37°48'	71°23'	0630-1300	600	-	1	2	-	-	-	-
	27			12	37°02'	70°00'	0630-1300	600	2	5	-	-	-	-	-
	28			13	36°46'	71°23'	0630-1320	620	2	6	-	-	-	-	-
	30			14	35°53'	72°35'	0630-1250	500	-	3	-	-	-	-	-
1959	6	Golden Eagle	1	1	38°54'	68°37'	0550-1615	700	15	3	-	-	-	-	-
	8			2	38°30'	68°27'	0600-1620	600	4	1	-	-	-	-	-
	9			3	39°01'	68°10'	0710-1600	600	1	-	1	-	-	-	1
	10			4	39°27'	68°30'	0600-1645	610	115	-	-	-	-	-	-
	11			5	39°44'	68°17'	0550-1615	700	20	-	-	-	-	-	-
	12			6	39°30'	68°38'	0630-1545	600	44	-	-	-	-	-	-
	13			7	39°30'	68°38'	0545-1535	600	20	-	-	-	-	-	-
	14			8	39°46'	68°40'	0600-1615	650	15	-	-	-	-	-	1
	16			9	39°26'	68°33'	0545-1650	650	84	-	-	-	-	-	-
1961	4	Crawford	62	34	35°00'	73°45'	0500-1120	390	1	5	-	-	-	-	-
	4-5			35	35°15'	74°23'	1830-0710	200	-	-	-	-	-	-	2
	5			36	35°50'	73°30'	1138-1712	290	-	-	-	-	-	-	-
	6			37	38°25'	72°50'	0915-1450	410	-	-	-	-	-	-	-
	7			38	39°18'	72°00'	0520-1756	410	-	-	-	-	-	-	-
1963	3	Delaware	63-4	33	36°27'	69°50'	0610-1505	560	2	6	-	-	-	-	-
	4			34	37°15'	70°57'	0615-1515	420	5	9	-	-	-	-	-
	5			35	37°17'	67°25'	0610-1345	420	1	2	-	-	-	-	-
	6			36	38°48'	68°53'	0615-1454	560	3	-	-	3	-	-	-
	6-7			37	39°23'	68°33'	2140-1135	280	5	-	-	1	-	-	4
	7			38	39°23'	68°33'	0620-1425	280	4	-	-	-	-	-	-
	8			39	40°00'	68°00'	0605-1425	420	47	-	-	2	-	-	-
	8-9			40	40°19'	68°00'	1915-0950	420	6	-	-	-	-	-	18
1964	1	Delaware	64-3	42	38°31'	70°01'	0620-1345	420	2	-	-	-	-	-	-
	1-2			43	38°47'	71°05'	2125-1000	210	3	-	-	2	-	-	-
	2			44	38°46'	71°07'	0615-1315	210	2	-	-	-	-	-	-
	2-3			45	39°09'	71°29'	2110-0805	280	-	-	-	-	-	-	1

Table 8.--Fishing log data for July

Year	Day	Vessel	Cruise No.	Station No.	Position		Time	Hooks	Bluefin	Yellowfin	Albacore	Bigeye	Skipjack	Blackfin	Swordfish
					Lat. N.	Long. W.	Start-End	No.	Number						
1957	2	Delaware	57-5	16	37°24'	73°40'	0630-1315	520	-	-	-	-	-	-	-
	3			17	37°59'	72°25'	0630-1320	600	-	-	-	-	-	-	-
1958	10	Delaware	58-3	1	40°24'	66°42'	0600-1545	600	4	-	-	6	-	-	-
	11			2	38°57'	66°42'	0600-1500	600	-	13	1	-	-	-	-
	12			3	37°42'	66°42'	0600-1500	600	-	11	-	-	1	-	-
	13			4	37°03'	68°14'	0600-1215	400	-	3	-	-	-	-	-
	14			5	38°35'	68°14'	0600-1600	600	-	36	4	-	-	-	-
	15			6	40°00'	68°14'	0600-1530	600	1	-	5	11	-	-	-
	16			7	39°45'	70°00'	0600-1500	570	-	6	1	3	-	-	-
	17			8	38°16'	70°00'	0600-1545	600	-	3	2	-	-	-	-
	18			9	37°02'	71°20'	0600-1530	600	-	8	1	-	-	-	-
	19			10	35°50'	72°35'	0615-1515	600	-	1	-	-	-	-	-
1961	25-26	Eugenie VIII	5	7	39°35'	72°25'	2000-0800	120	-	-	-	-	-	-	1
	26-27			8	39°37'	71°35'	2115-0900	120	-	-	-	1	-	-	-

Table 9.--Fishing log data for August

Year	Day	Vessel	Cruise No.	Station No.	Position		Time	Hooks	Bluefin	Yellowfin	Albacore	Bigeye	Skipjack	Blackfin	Swordfish
					Lat. N.	Long. W.	Start-End	No.	Number						
1958	1	Delaware	58-3	17	36°05'	64°32'	0600-1500	600	-	1	-	-	-	-	-
	2			18	39°21'	64°32'	0600-1500	600	-	5	-	1	-	-	-
	3			19	41°19'	64°32'	0600-1500	600	-	3	-	-	-	-	-
1961	2-3	Bear	265	1	38°32'	73°06'	2000-0855	150	-	-	-	-	-	-	2
	4			2	38°12'	72°10'	0400-0820	170	-	8	-	-	-	-	-
	8-9			3	38°22'	71°57'	2300-0830	210	-	-	-	-	-	-	2
	9-10			4	38°07'	71°10'	2130-0830	210	-	-	1	-	-	-	1

Table 10.--Fishing log data for September

Year	Day	Vessel	Cruise No.	Station No.	Position		Time	Hooks	Bluefin	Yellowfin	Albacore	Bigeye	Skipjack	Blackfin	Swordfish
					Lat. N.	Long. W.	Start-End	No.	Number						
1957	11	Delaware	57-8	1	42°18'	64°02'	0700-1330	600	-	3	3	1	-	-	-
	12			2	40°34'	64°02'	0635-1440	600	-	12	1	-	-	-	-
	13			3	38°49'	64°02'	0645-1410	600	-	6	2	-	1	-	-
	14			4	37°44'	65°42'	0640-1500	600	-	21	1	-	1	-	-
	16			5	40°00'	68°05'	0700-1210	600	-	1	-	-	-	-	-
	21			6	40°27'	66°15'	0630-1315	600	-	19	4	-	-	-	-
	22			7	39°07'	65°58'	0630-1330	600	-	37	8	-	-	-	-
	23			8	38°28'	68°05'	0645-1215	400	-	10	4	-	-	-	-
	25			9	39°44'	70°00'	0900-1440	400	-	6	1	-	-	-	-
1961	27-28	Eugenie VIII	12	1	39°35'	72°27'	1928-0830	150	-	-	-	-	-	-	1

Table 11.--Fishing log data for October

Year	Day	Vessel	Cruise No.	Station No.	Position		Time	Hooks	Bluefin	Yellowfin	Albacore	Bigeye	Skipjack	Blackfin	Swordfish
					Lat. N.	Long. W.	Start-End	No.	Number						
1957	2	Delaware	57-8	10	36°57'	68°05'	0640-1300	600	-	27	1	-	-	1	-
	3			11	36°42'	70°00'	0630-1340	600	-	51	-	-	1	-	-
	4			12	38°12'	70°00'	0625-1230	600	-	12	12	1	1	-	-
	7			13	39°17'	71°49'	0625-1230	350	-	4	-	-	-	-	-
	8			14	37°45'	71°49'	0625-1320	600	-	34	-	1	-	-	-
	9			15	36°15'	71°49'	0620-1300	600	-	24	2	-	-	-	-
1961	1	Eugenie VIII	12	3	40°02'	71°20'	0400-1018	150	-	-	-	-	-	-	4
1961	17	Cap'n Bill III	61-1	1	39°04'	69°35'	1300-1700	170	-	-	1	-	-	-	-
	18			2	38°33'	69°10'	0700-1300	280	-	-	2	-	-	-	-
1961	28	Cap'n Bill III	61-2	1	39°29'	69°38'	1300-1700	100	-	-	1	-	-	-	-
1962	9-10	Cap'n Bill III	62-1	1	38°41'	71°48'	2140-0930	250	-	-	-	-	-	-	1
	11			2	38°35'	71°28'	0100-0830	180	-	1	2	-	-	-	-
	12			3	38°22'	70°55'	0100-0900	170	-	1	-	3	-	-	-
	14			4	39°42'	71°13'	0115-1020	250	-	-	2	24	-	-	6
	14-15			5	40°00'	71°20'	2215-0830	250	-	-	1	-	-	-	10
1962	23	Cap'n Bill III	62-2	1	39°55'	69°34'	0015-0900	320	-	-	-	-	-	-	12
	23			2	39°53'	69°36'	1030-1730	210	95	-	1	-	-	-	-
	23-24			3	39°51'	69°40'	2030-1100	550	7	-	-	1	-	-	12
	24-25			4	39°55'	69°42'	1840-0945	390	-	-	-	-	-	-	9
	25			5	40°05'	69°58'	1105-1715	260	16	-	-	1	-	-	-
	25-26			6	40°06'	69°02'	2135-1100	430	-	-	-	1	-	-	14
	27-28			7	40°01'	69°05'	1930-1030	520	-	-	-	3	-	-	26
	29			8	40°04'	69°03'	0045-1335	540	6	-	-	3	-	-	1
	29-30			9	40°00'	69°59'	1915-1300	540	7	-	-	3	-	-	14
	30-31			10	39°59'	68°58'	1850-1055	490	4	-	-	1	-	-	16
1964	17	Delaware	64-10	1	40°59'	63°53'	0620-1350	300	-	-	-	3	-	-	-
	18			2	41°16'	62°12'	0640-1250	300	-	-	-	6	-	-	-
	19			3	41°34'	61°00'	0655-1340	385	-	-	3	4	-	-	-
	20			4	40°48'	62°18'	0630-1345	500	-	5	-	2	-	-	-
	28			5	41°01'	63°56'	0630-1405	560	-	3	1	-	-	-	-
	29			6	40°30'	61°24'	0630-1510	600	-	2	11	-	-	-	-
	30			7	41°47'	59°21'	0635-1500	600	-	1	7	2	-	-	-
	31			8	42°48'	58°39'	0820-1400	300	-	-	5	3	-	-	-

Table 12.--Fishing log data for November

Year	Day	Vessel	Cruise No.	Station No.	Position Lat. N.	Position Long. W.	Time Start-End	Hooks	Bluefin	Yellowfin	Albacore	Bigeye	Skipjack	Blackfin	Swordfish
								No.	Number						
1960	12	Crawford	56	1	39°16'	71°53'	0655-1500	310	53	-	3	1	-	-	-
	13			2	36°56'	74°18'	0650-1313	360	2	-	1	-	-	-	-
	14			3	35°31'	74°27'	0615-1330	400	-	3	-	-	-	1	-
	15			4	37°28'	71°53'	0607-1205	400	-	-	1	-	-	-	-
	16			5	38°11'	69°59'	0610-1343	430	-	-	5	-	-	-	-
	17			6	39°52'	68°56'	0617-1415	320	187	-	-	-	-	-	-
	21			8	38°45'	68°05'	0630-1340	330	-	-	-	-	-	-	-
	22			9	40°28'	66°51'	0643-1320	350	5	-	-	1	-	-	-
	23			10	41°43'	65°28'	0623-1510	450	6	-	-	-	-	-	1
	24			11	42°03'	64°21'	1245-1529	170	1	-	-	-	-	-	-
	25			12	40°49'	64°57'	0600-1500	490	1	-	2	-	-	-	-
	26			13	40°03'	67°37'	0618-1350	500	30	-	10	4	-	-	1
	27			14	39°45'	70°17'	0605-1425	510	70	-	1	-	-	-	-
1961	9	Eugenie VIII	14	2	39°50'	71°14'	0710-1130	210	5	-	2	-	-	-	-
	15			3	37°15'	74°30'	0740-1230	210	-	-	-	1	-	-	-
1962	8	Cap'n Bill III	62-3	1	39°55'	69°40'	0000-1100	550	-	1	-	-	-	-	11
	8			2	39°48'	69°33'	1255-1725	210	-	-	-	7	-	-	-
	8-9			3	39°52'	69°29'	2115-1100	600	1	-	1	10	-	-	6
	9-10			4	40°00'	69°05'	2000-1320	730	1	-	-	18	-	-	38
	12			5	39°56'	68°41'	0930-1615	150	-	3	-	3	-	-	-
	12-13			6	39°59'	69°04'	2000-1300	730	3	-	-	8	-	-	22
	13-14			7	40°01'	69°09'	2015-1230	730	3	-	-	6	-	-	17
1962	29-30	Cap'n Bill III	62-4	1	40°17'	68°09'	1920-1130	660	1	-	-	2	-	-	20
	30-1			2	40°17'	67°40'	1805-1110	660	4	-	1	-	-	-	17
1963	15	Delaware	63-11	1	42°02'	64°06'	0730-1445	420	-	-	-	-	-	-	-
	17-18			2	42°00'	62°45'	2150-0815	210	-	-	-	-	-	-	-
	20			4	41°14'	59°56'	0635-1410	420	-	2	5	1	1	-	-
	21			5	40°39'	62°16'	0625-1355	420	-	4	1	-	-	-	-
	21-22			6	41°00'	62°48'	2150-1050	210	-	-	-	6	-	-	2
	22			7	41°06'	62°45'	0645-1315	210	-	1	-	2	-	-	-
	23			8	40°22'	64°00'	0625-1415	420	2	6	12	4	-	-	-

Table 13.--Fishing log data for December

Year	Day	Vessel	Cruise No.	Station No.	Position Lat. N.	Position Long. W.	Time Start-End	Hooks	Bluefin	Yellowfin	Albacore	Bigeye	Skipjack	Blackfin	Swordfish
								No.	Number						
1962	1	Cap'n Bill III	62-4	3	40°12'	67°35'	1235-1730	200	29	-	-	-	-	-	-
	1-2			4	40°24'	67°43'	1900-1120	660	-	-	-	-	-	-	47
1962	11-12	Cap'n Bill III	62-5	1	40°20'	67°39'	1900-1130	670	6	-	-	-	-	-	37
	12-13			2	40°23'	67°41'	1900-1000	630	-	-	-	-	-	-	19
	13-14			3	40°21'	67°39'	1900-1130	630	-	-	-	-	-	-	40
	14-15			4	40°22'	67°40'	1900-1200	600	-	-	-	-	-	-	50
	15-16			5	40°19'	67°40'	1900-1000	380	-	-	-	-	-	-	13
	16-17			6	40°21'	67°38'	1900-1200	600	-	-	-	-	-	-	50
	17-18			7	40°19'	67°40'	1900-1200	620	-	-	-	-	-	-	47
	18-19			8	41°18'	66°11'	1900-1500	620	-	-	-	-	-	-	91
	19-20			9	41°17'	66°10'	2300-1100	630	-	-	-	14	-	-	19
1963	5	Delaware	63-11	9	40°15'	64°12'	0620-1420	420	-	-	6	5	-	-	-
	5-6			10	40°13'	65°45'	2140-1050	210	-	-	1	-	-	-	1
	6			11	40°12'	65°44'	0700-1305	210	-	-	-	-	-	-	-
	7-8			12	39°06'	66°26'	2135-1025	210	-	-	-	1	-	-	-
	8			13	39°07'	66°30'	0635-1235	210	-	-	-	-	-	-	-

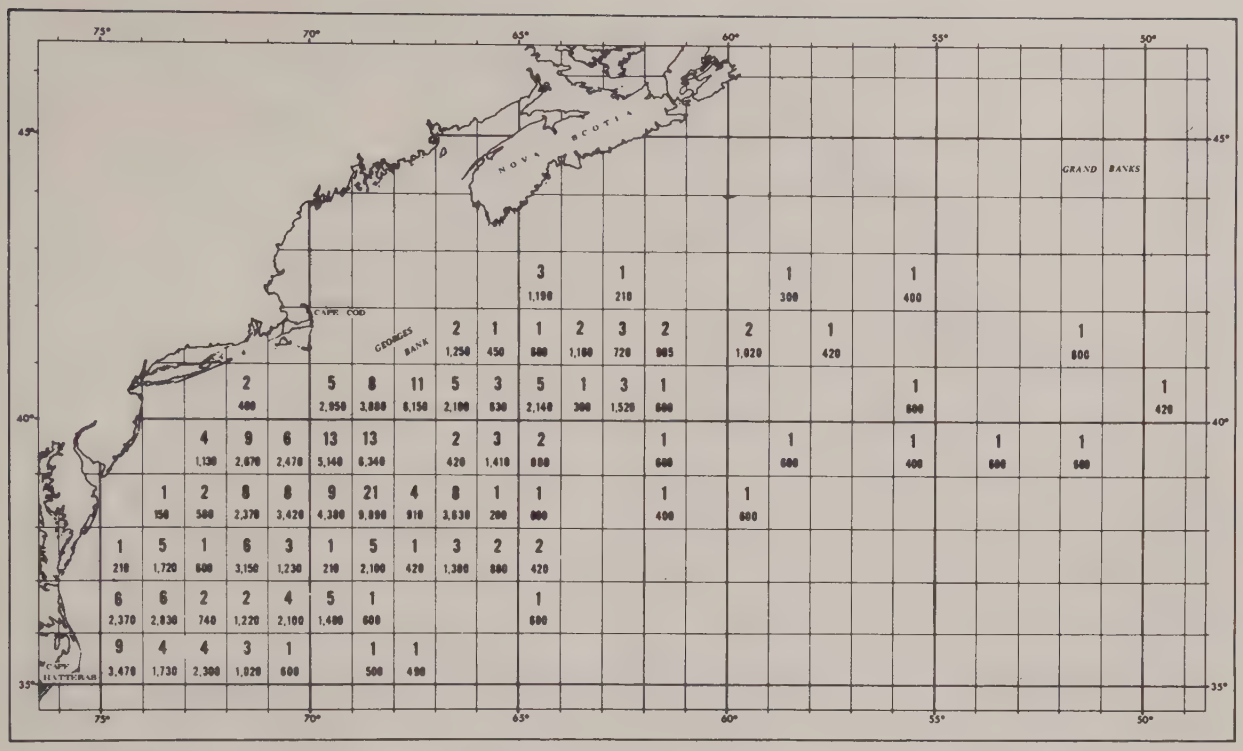

Figure 2.--Total sampling effort--number of longline sets and hooks fished within each 1° latitude and longitude square.

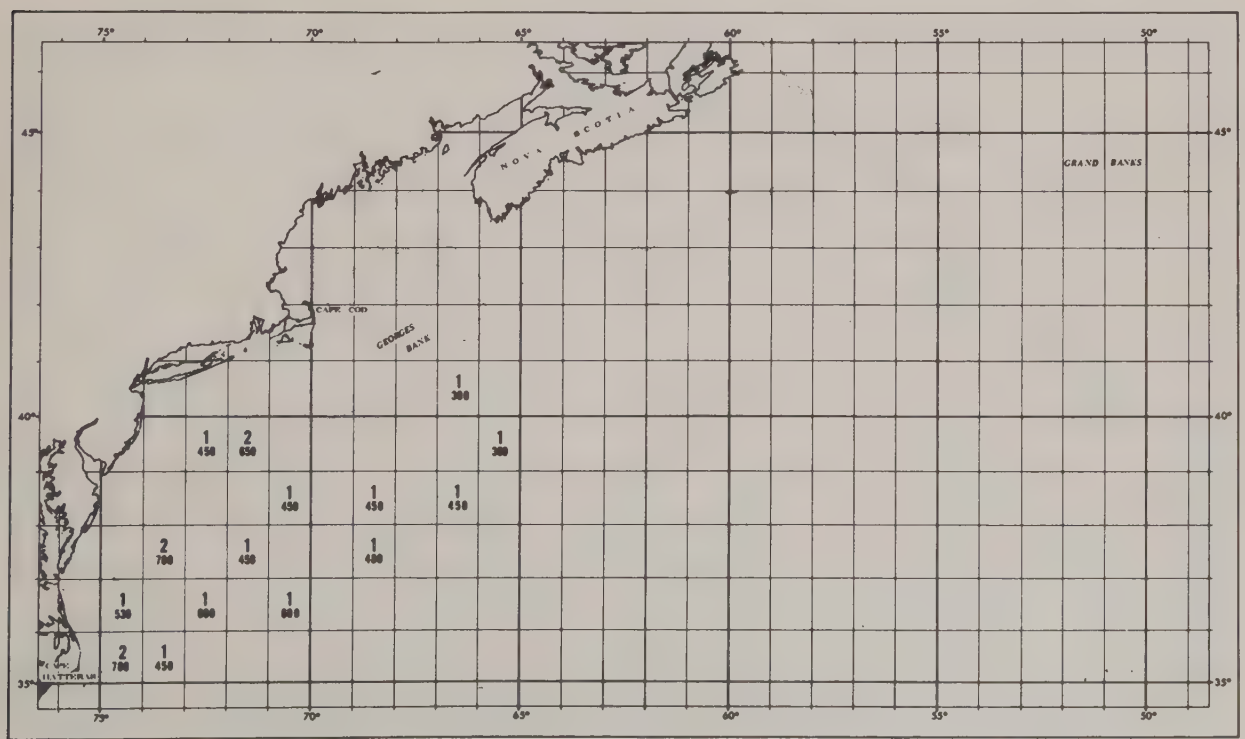

Figure 3.--January sampling effort--number of longline sets and hooks fished within each 1° latitude and longitude square.

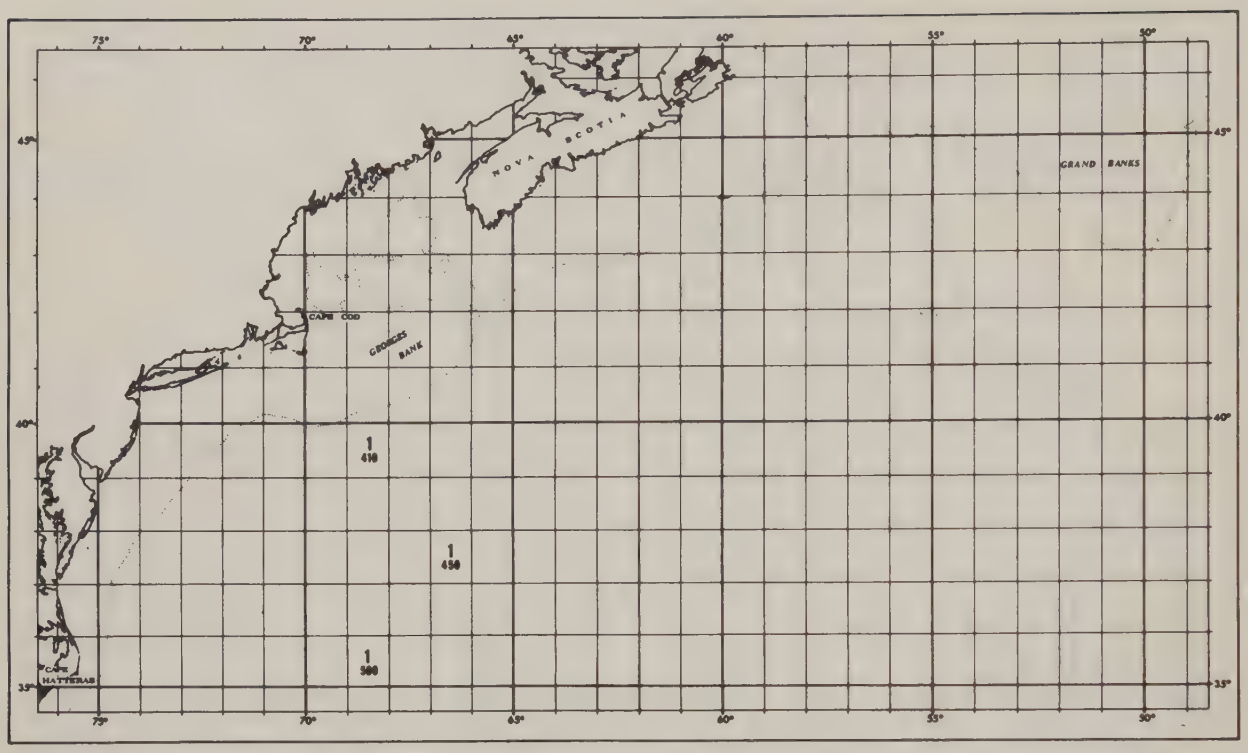

Figure 4.--February sampling effort--number of longline sets and hooks fished within each 1° latitude and longitude square.

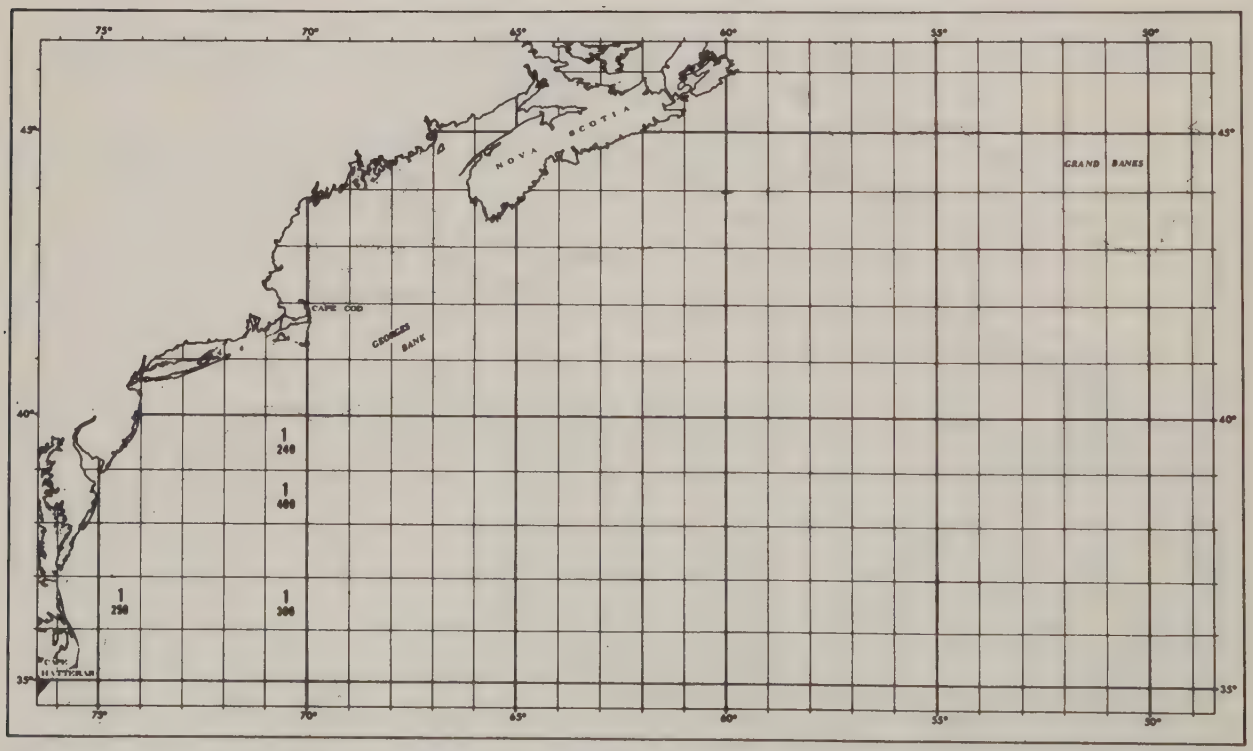

Figure 5.--March sampling effort--number of longline sets and hooks fished within each 1° latitude and longitude square.

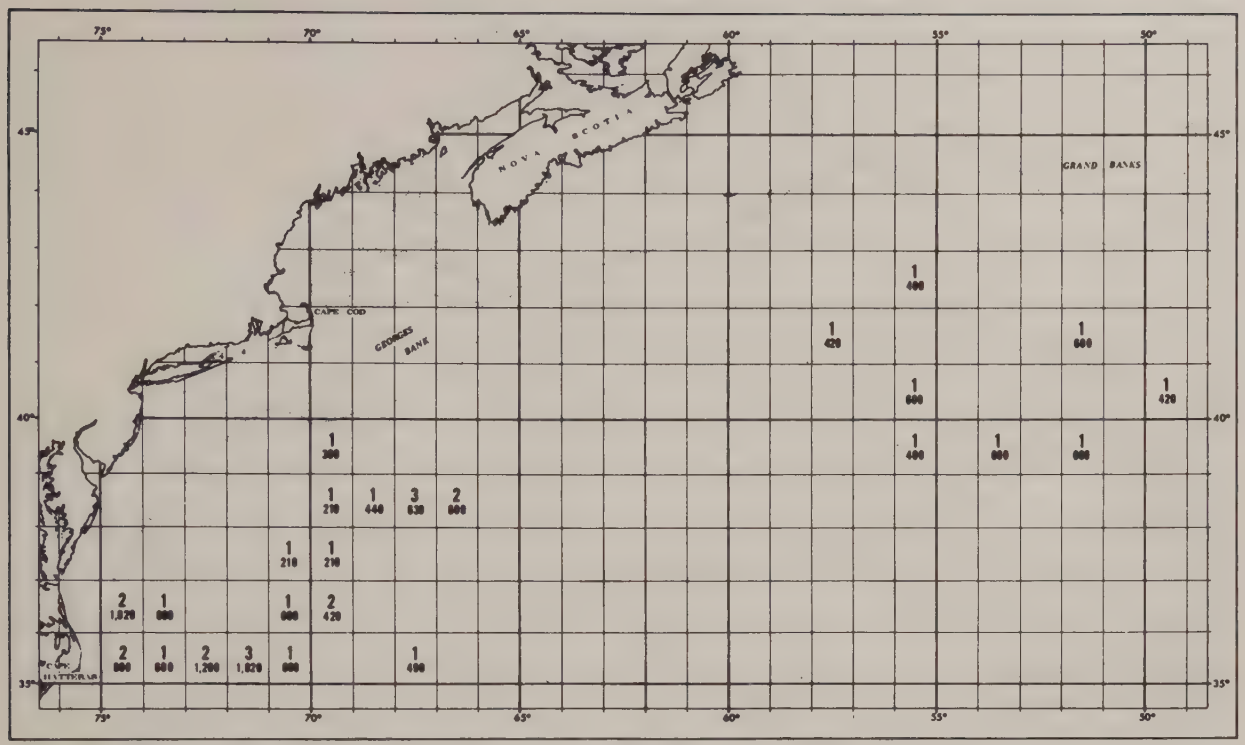

Figure 6.--April sampling effort--number of longline sets and hooks fished within each 1° latitude and longitude square.

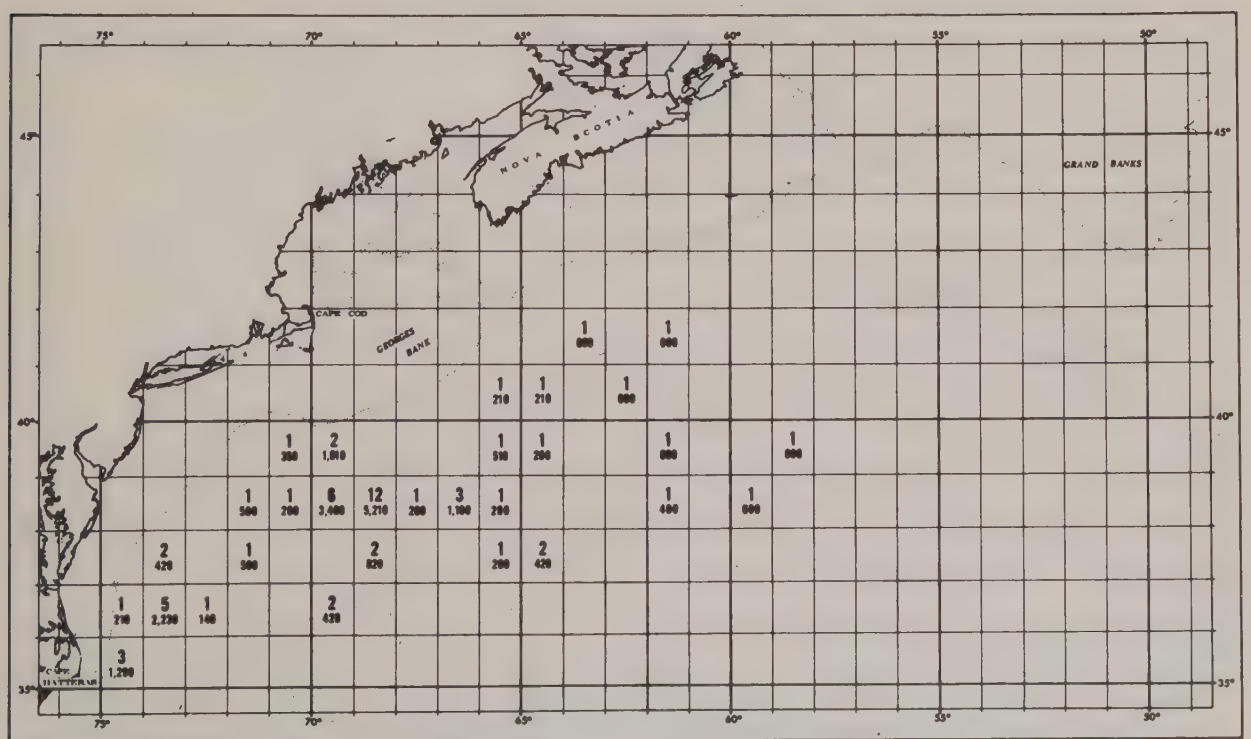

Figure 7.--May sampling effort--number of longline sets and hooks fished within each 1° latitude and longitude square.

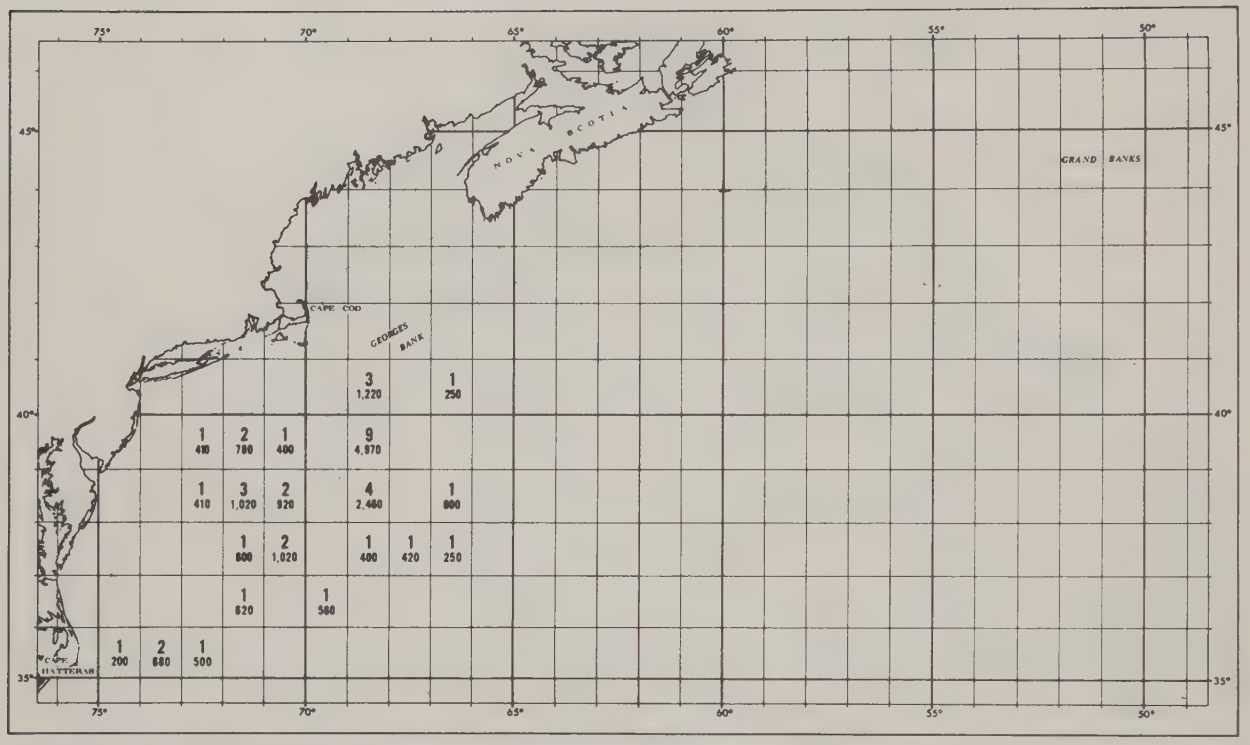

Figure 8.--June sampling effort--number of longline sets and hooks fished within each 1° latitude and longitude square.

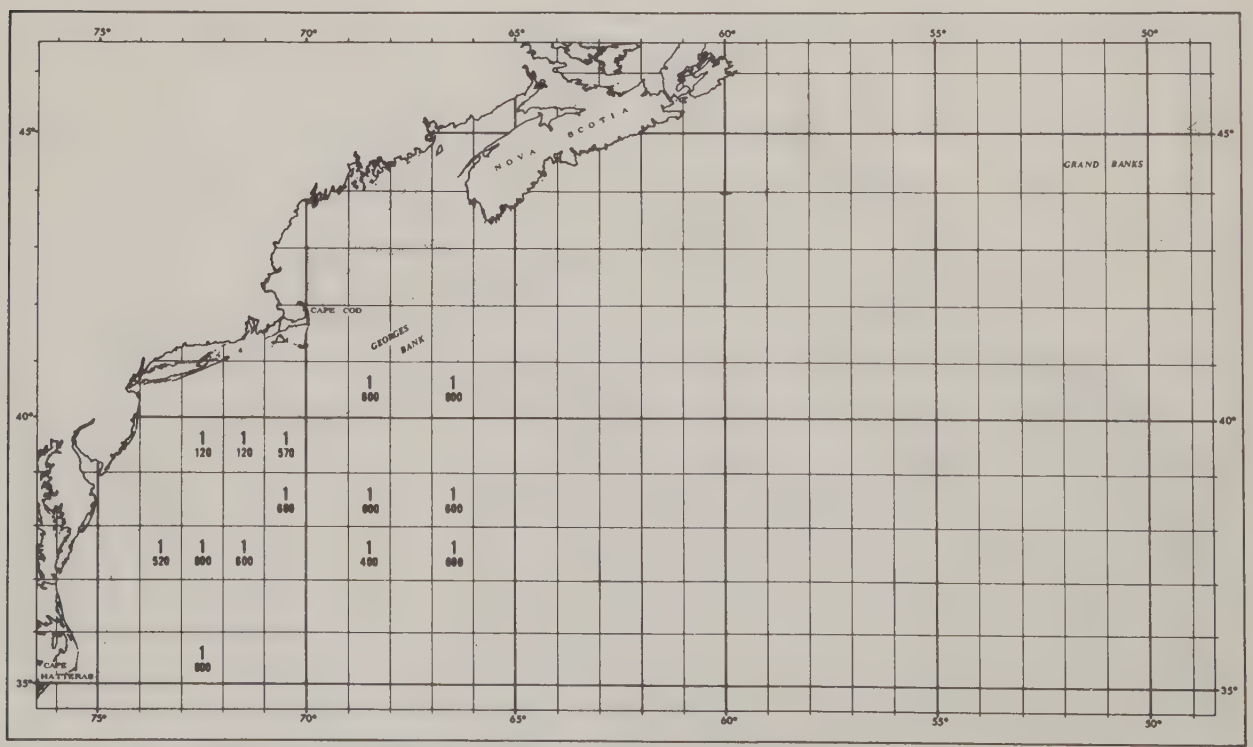

Figure 9.--July sampling effort--number of longline sets and hooks fished within each 1° latitude and longitude square.

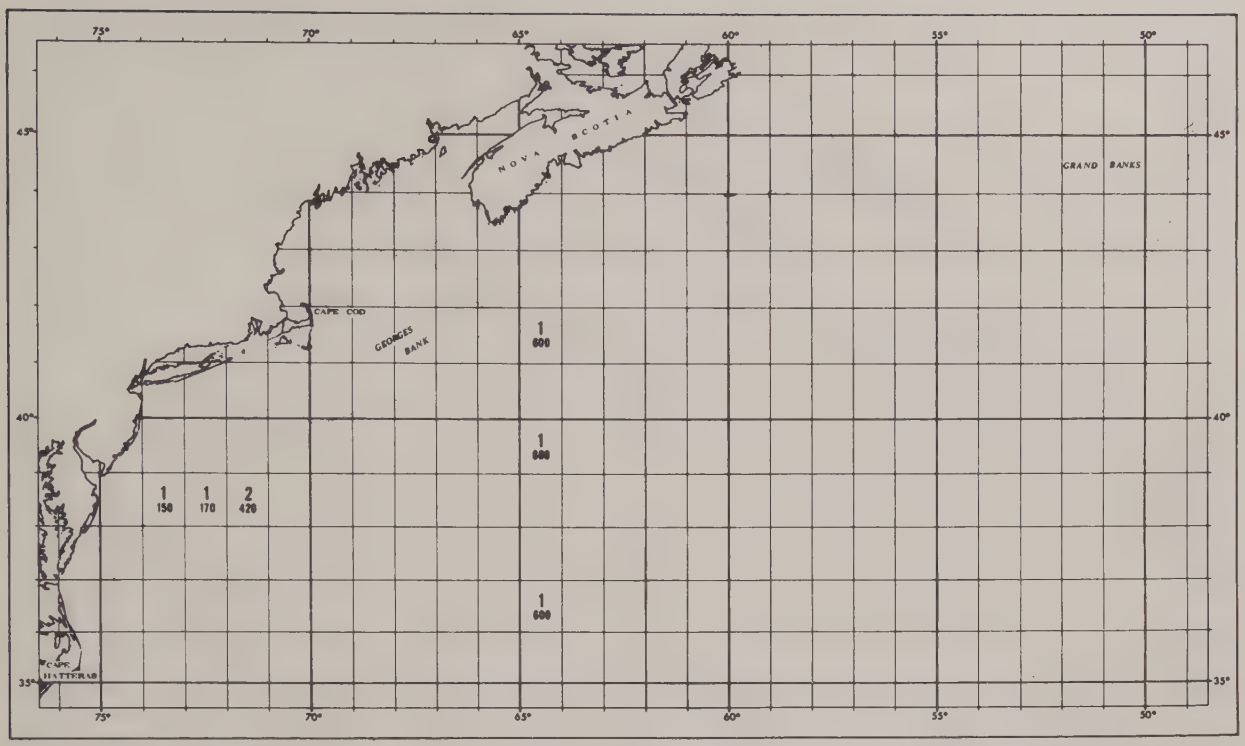

Figure 10.--August sampling effort--number of longline sets and hooks fished within each 1° latitude and longitude square.

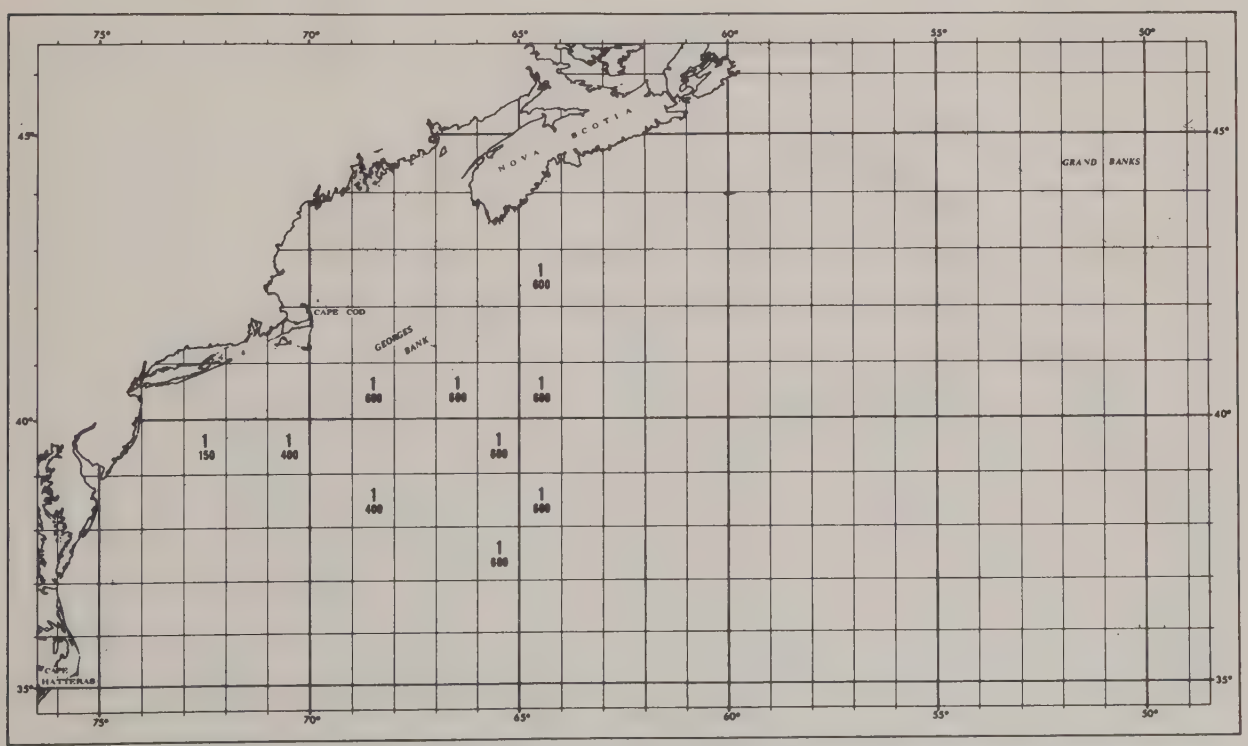

Figure 11.--September sampling effort--number of longline sets and hooks fished within each 1° latitude and longitude square.

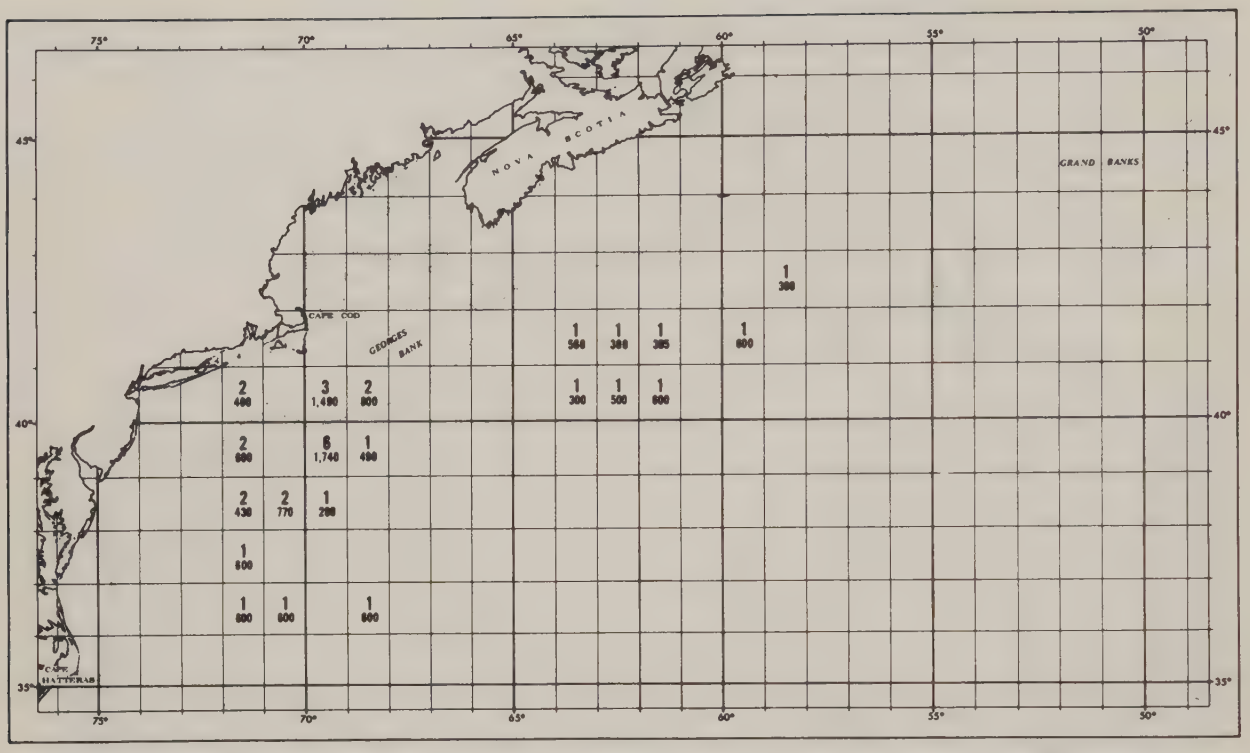

Figure 12.--October sampling effort--number of longline sets and hooks fished within each 1° latitude and longitude square.

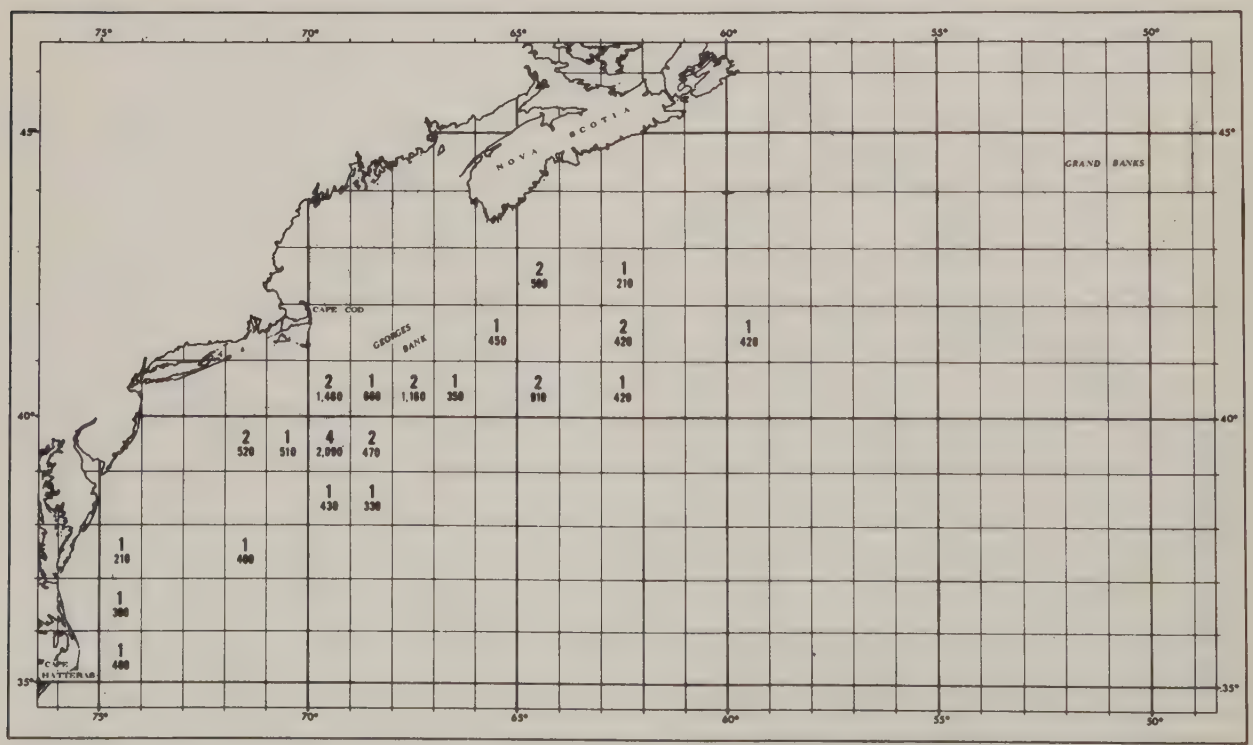

Figure 13.--November sampling effort--number of longline sets and hooks fished within each 1° latitude and longitude square.

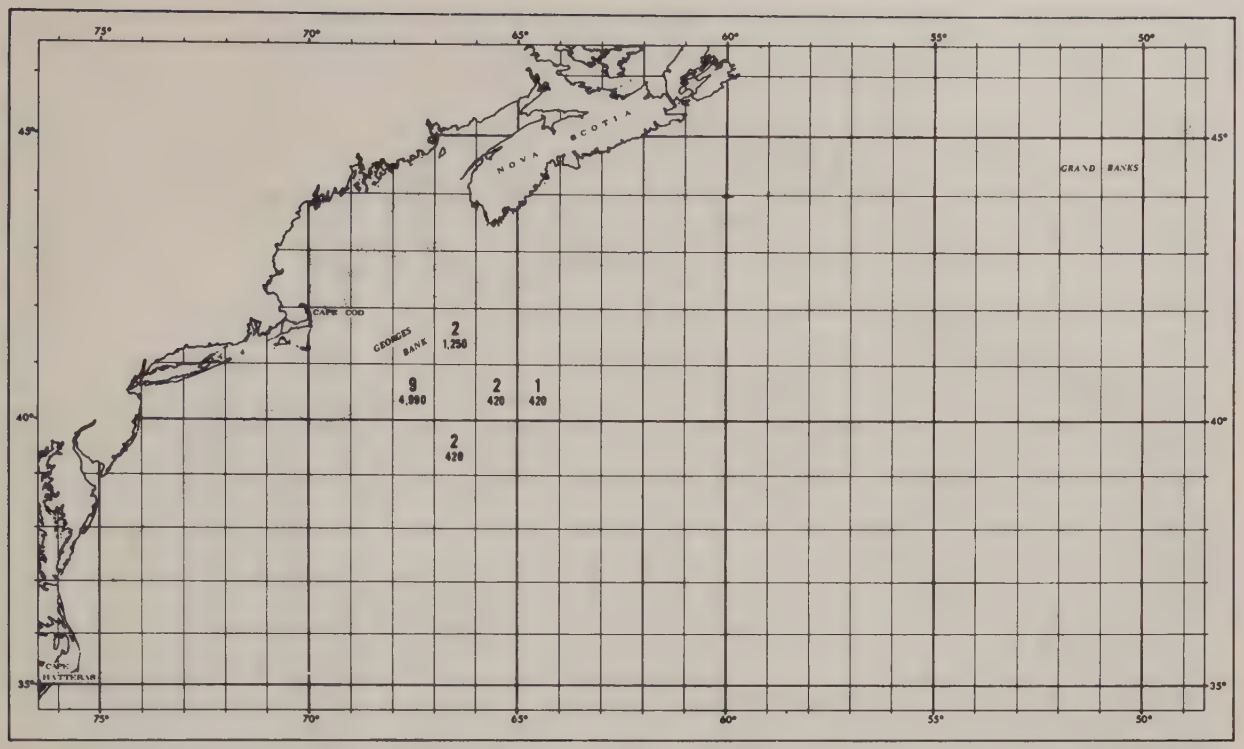

Figure 14.--December sampling effort--number of longline sets and hooks fished within each 1° latitude and longitude square.

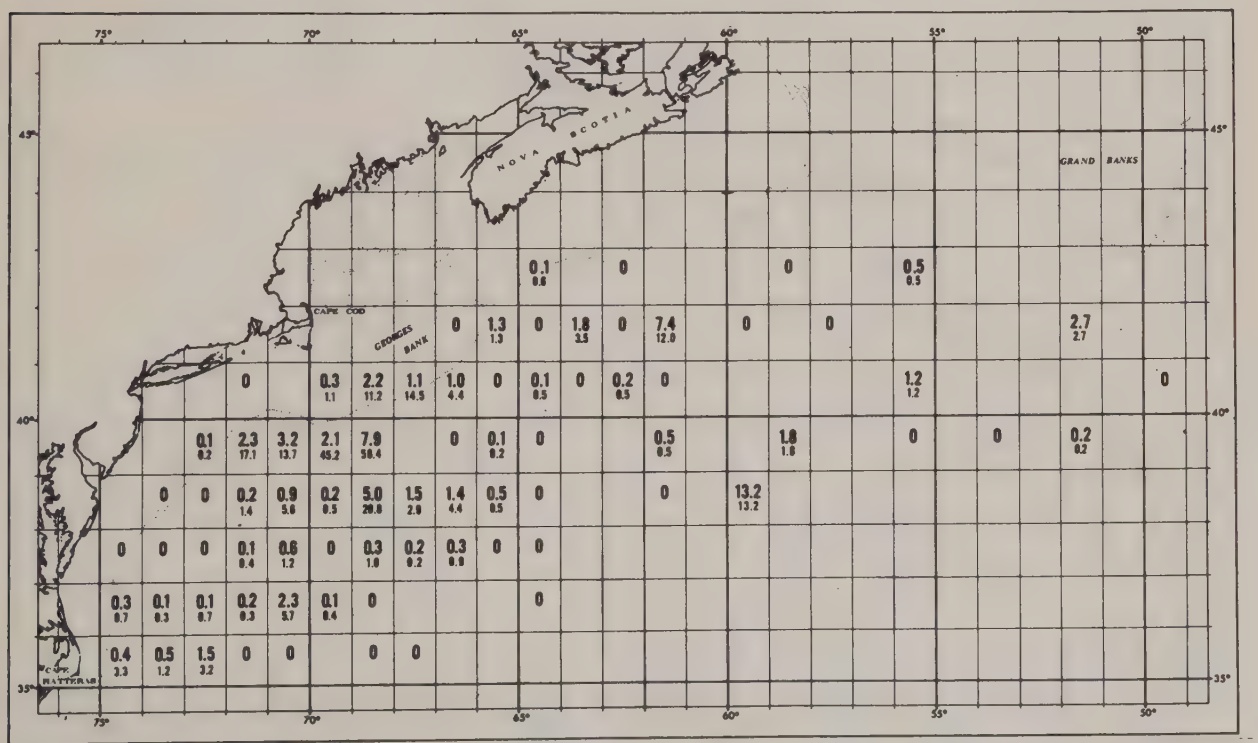

Figure 15.--Number of bluefin tuna caught per 100 hooks (average and maximum) within each 1° latitude and longitude square.

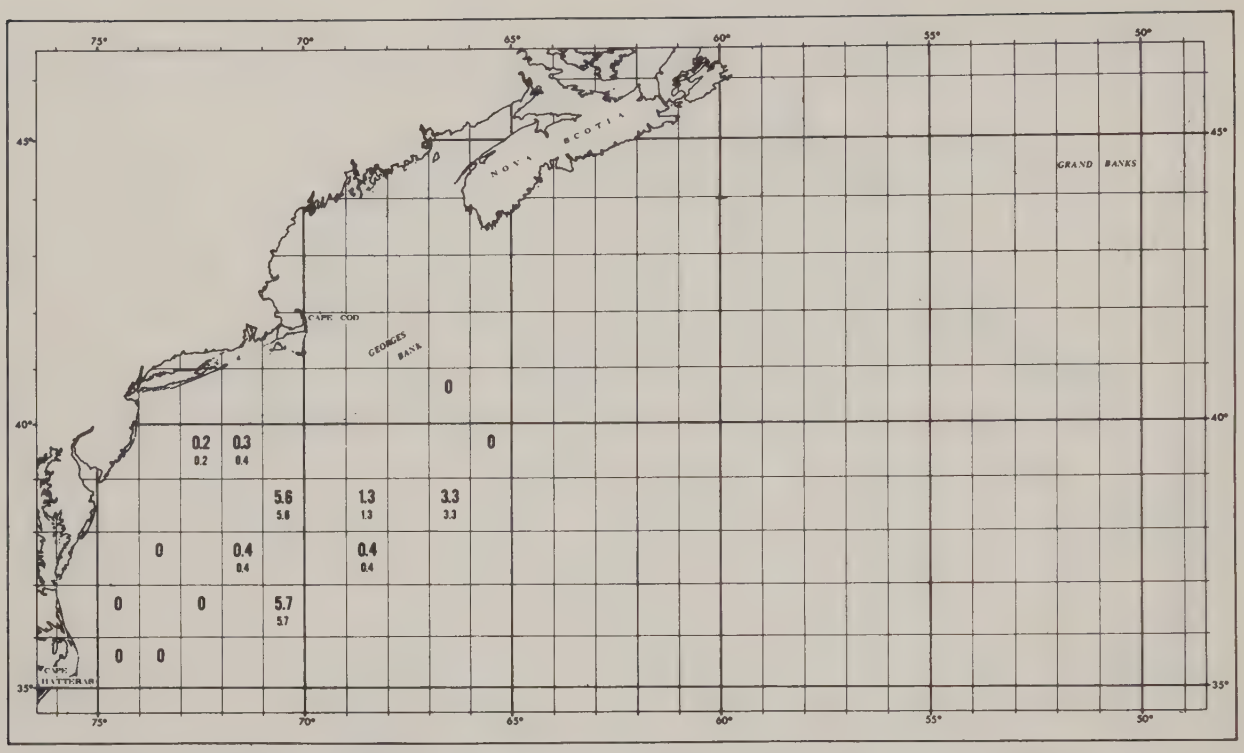

Figure 16.--Number of bluefin tuna caught in January per 100 hooks (average and maximum) within each 1° latitude and longitude square.

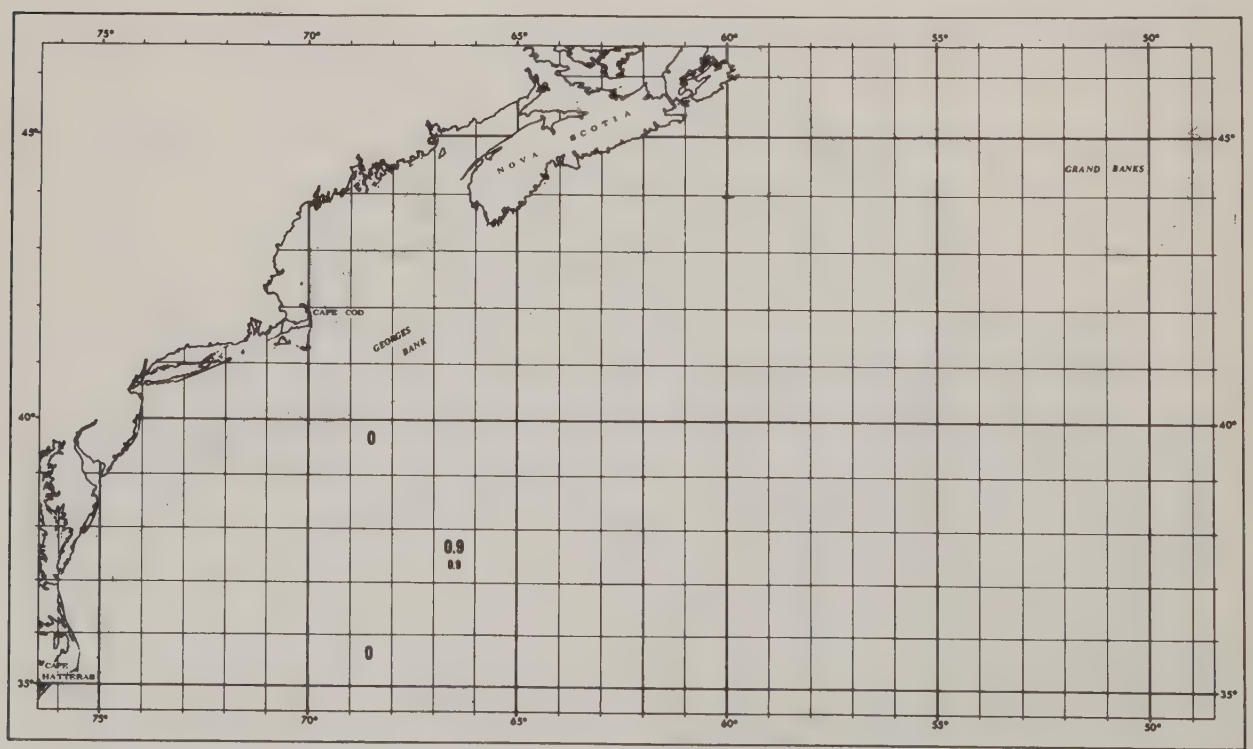

Figure 17.--Number of bluefin tuna caught in February per 100 hooks (average and maximum) within each 1° latitude and longitude square.

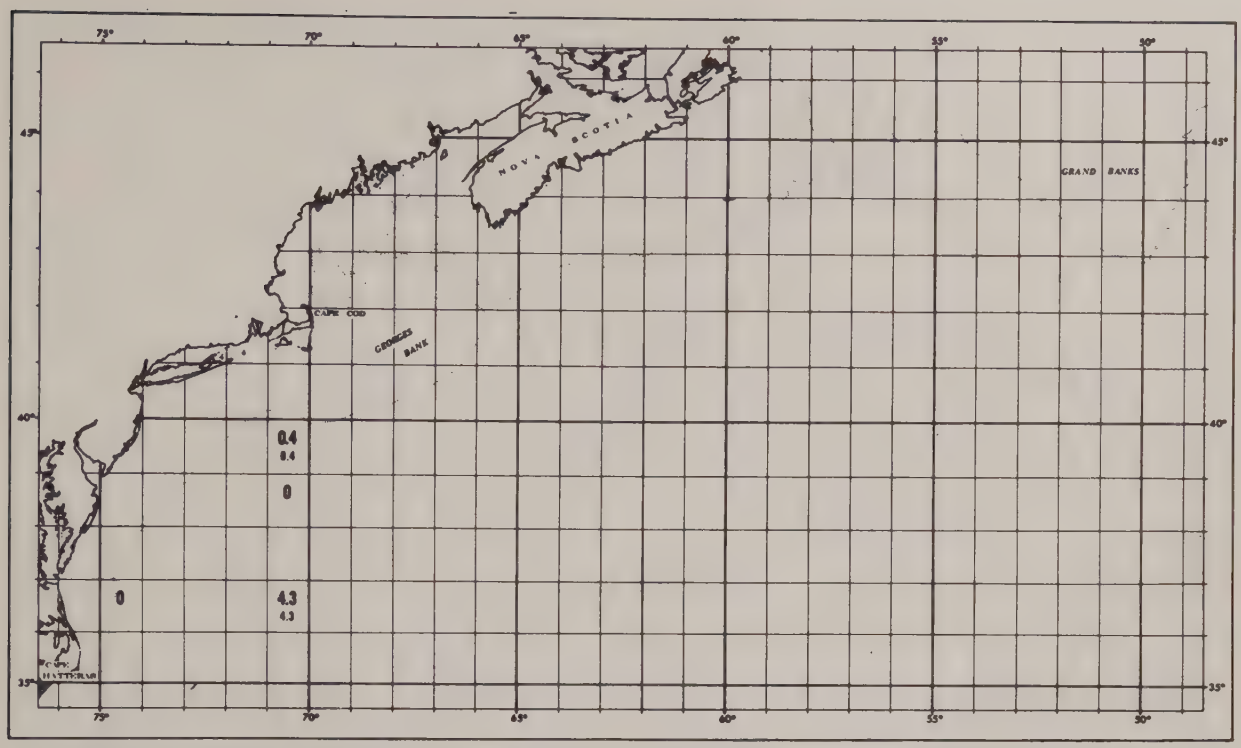

Figure 18.--Number of bluefin tuna caught in March per 100 hooks (average and maximum) within each 1° latitude and longitude square.

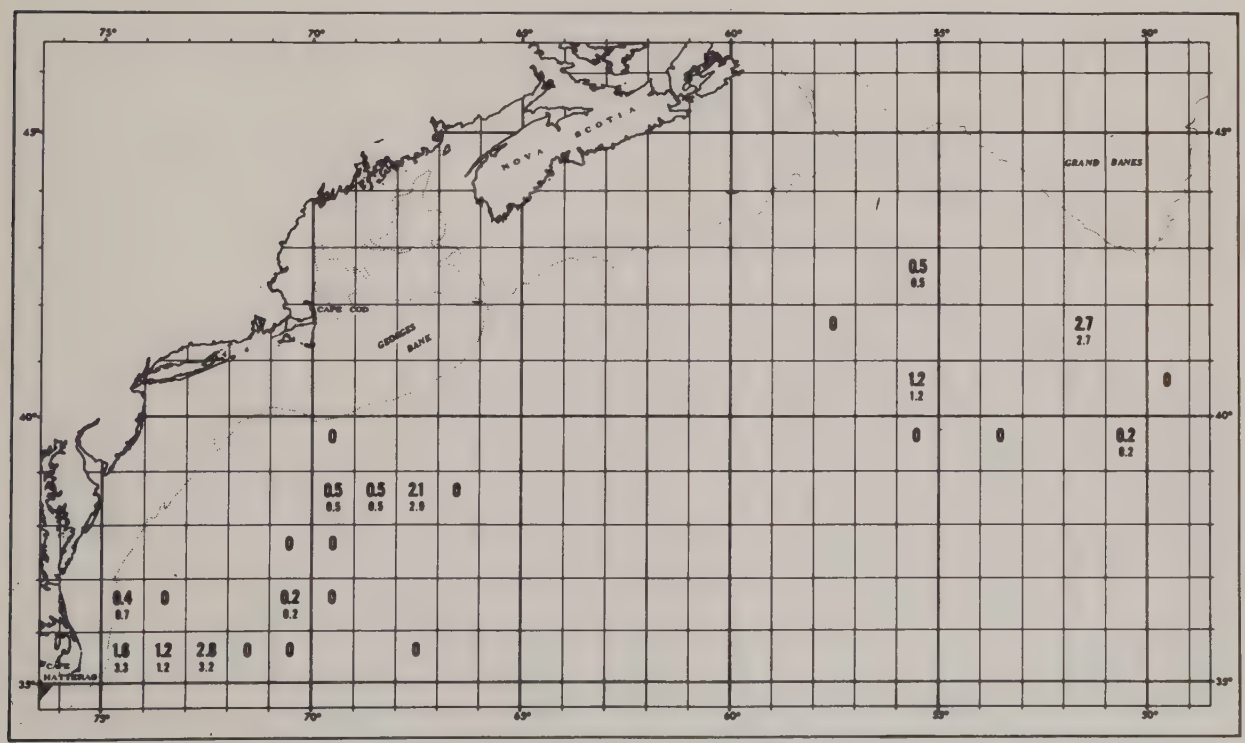

Figure 19.--Number of bluefin tuna caught in April per 100 hooks (average and maximum) within each 1° latitude and longitude square.

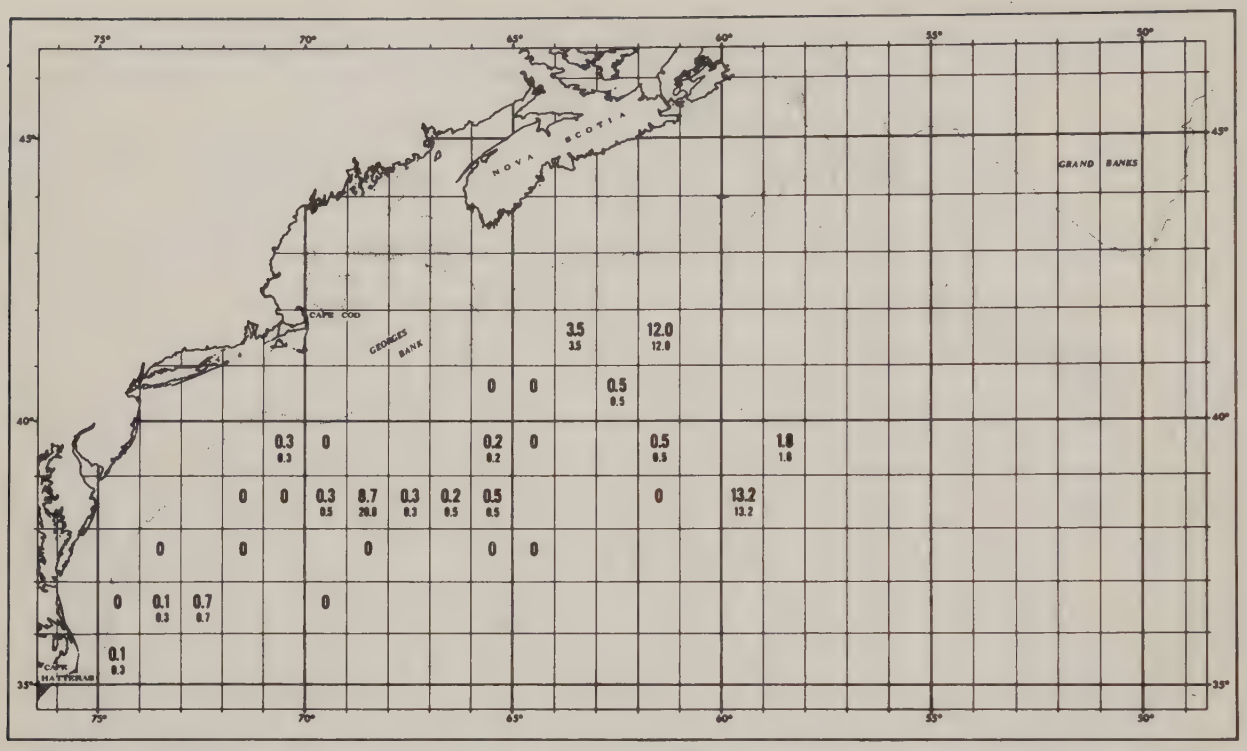

Figure 20.--Number of bluefin tuna caught in May per 100 hooks (average and maximum) within each 1° latitude and longitude square.

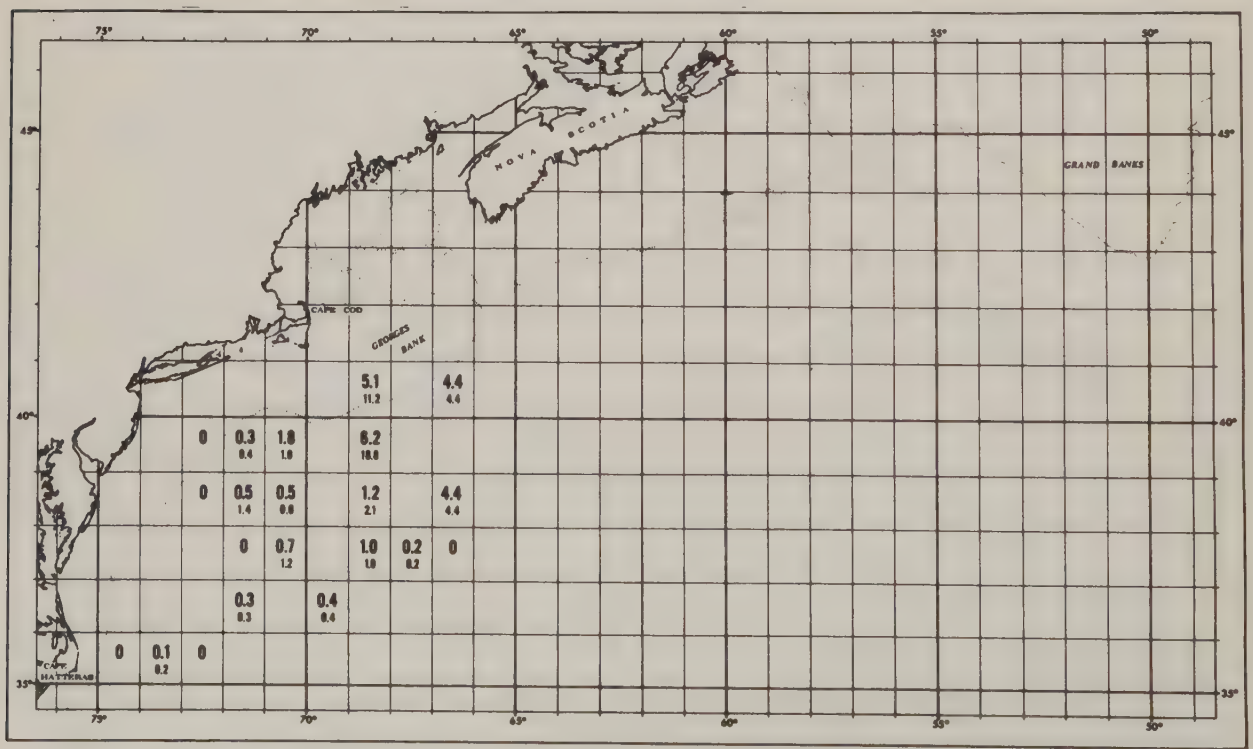

Figure 21.--Number of bluefin tuna caught in June per 100 hooks (average and maximum) within each 1° latitude and longitude square.

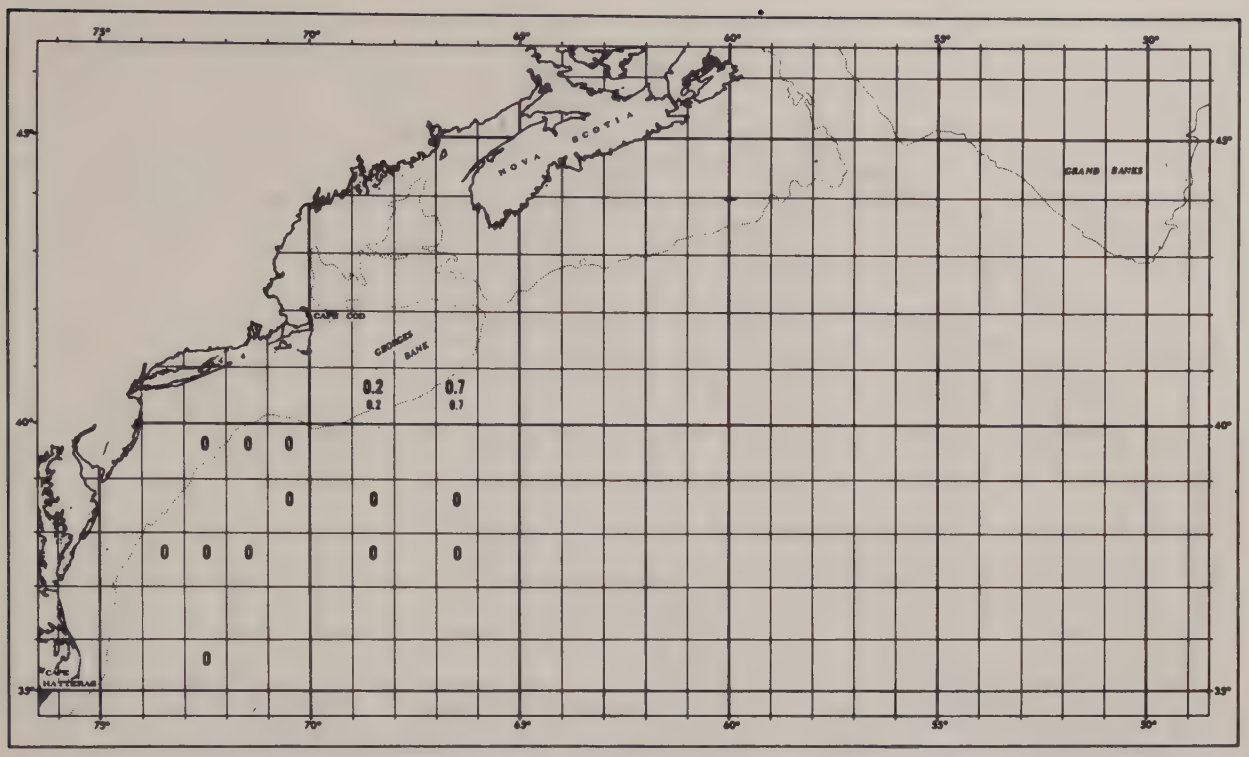

Figure 22.--Number of bluefin tuna caught in July per 100 hooks (average and maximum) within each 1° latitude and longitude square.

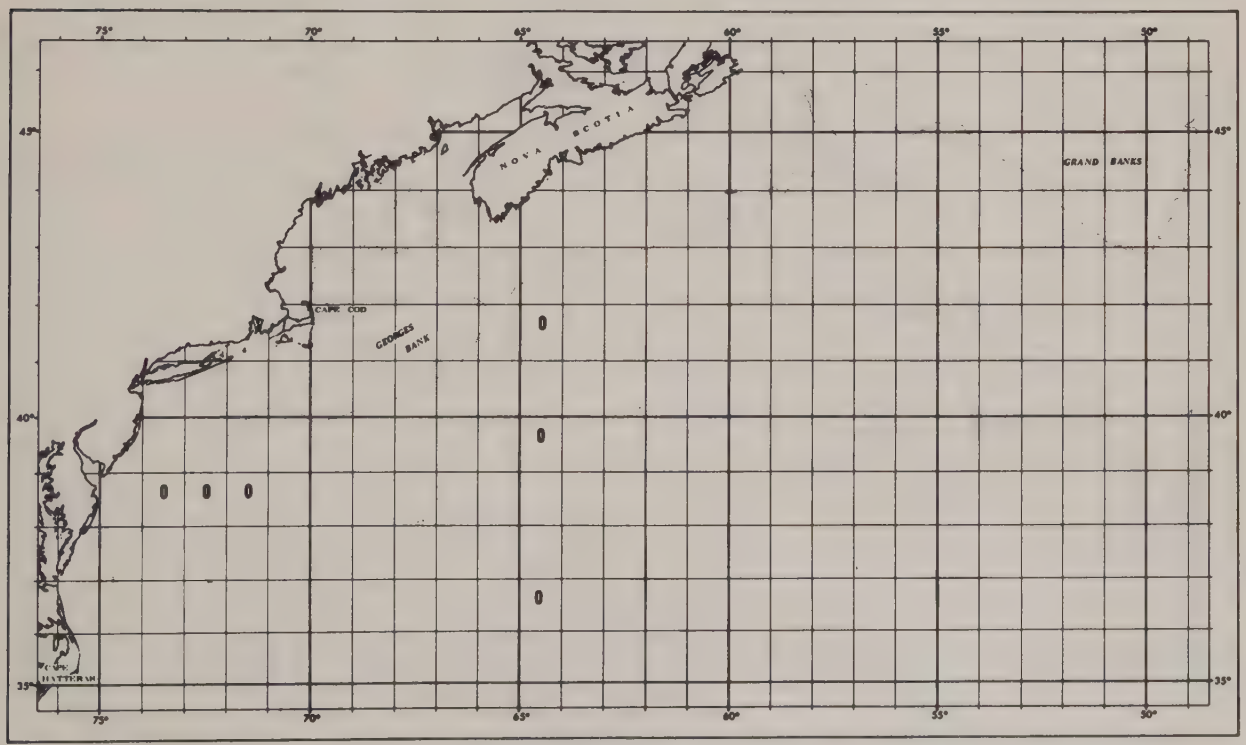

Figure 23.--Number of bluefin tuna caught in August per 100 hooks (average and maximum) within each 1° latitude and longitude square.

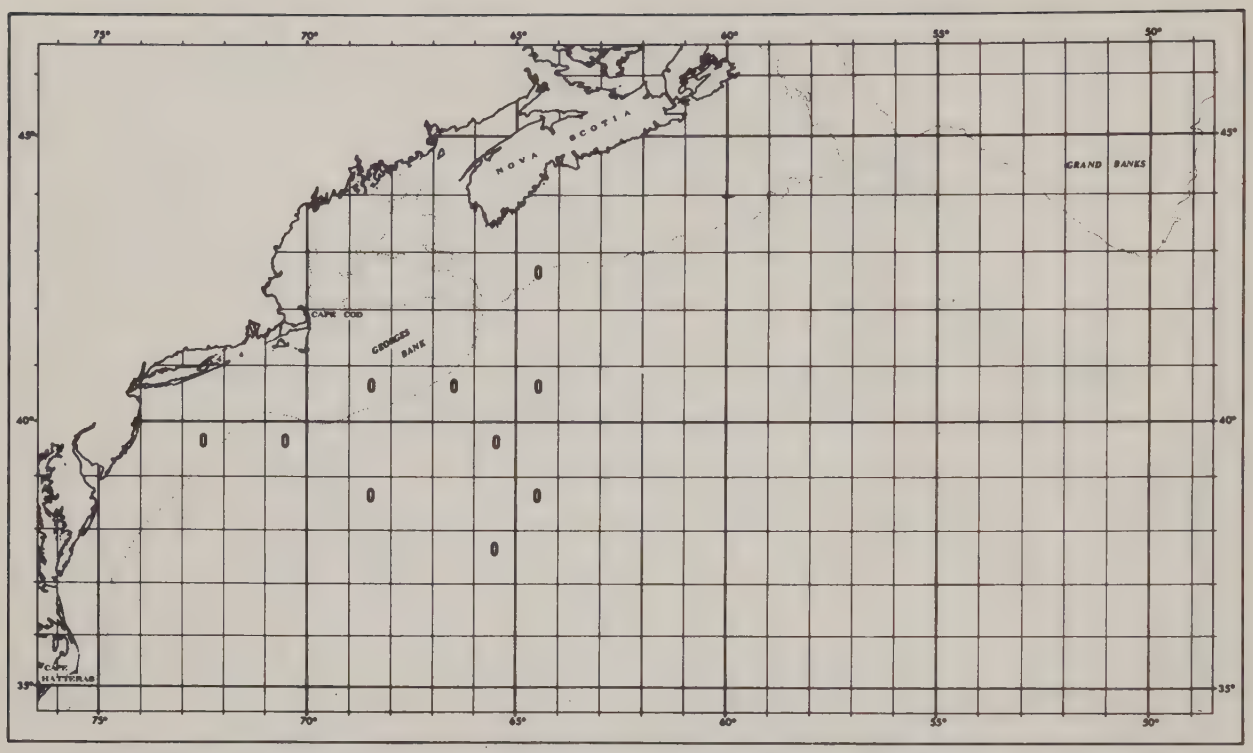

Figure 24.--Number of bluefin tuna caught in September per 100 hooks (average and maximum) within each 1° latitude and longitude square.

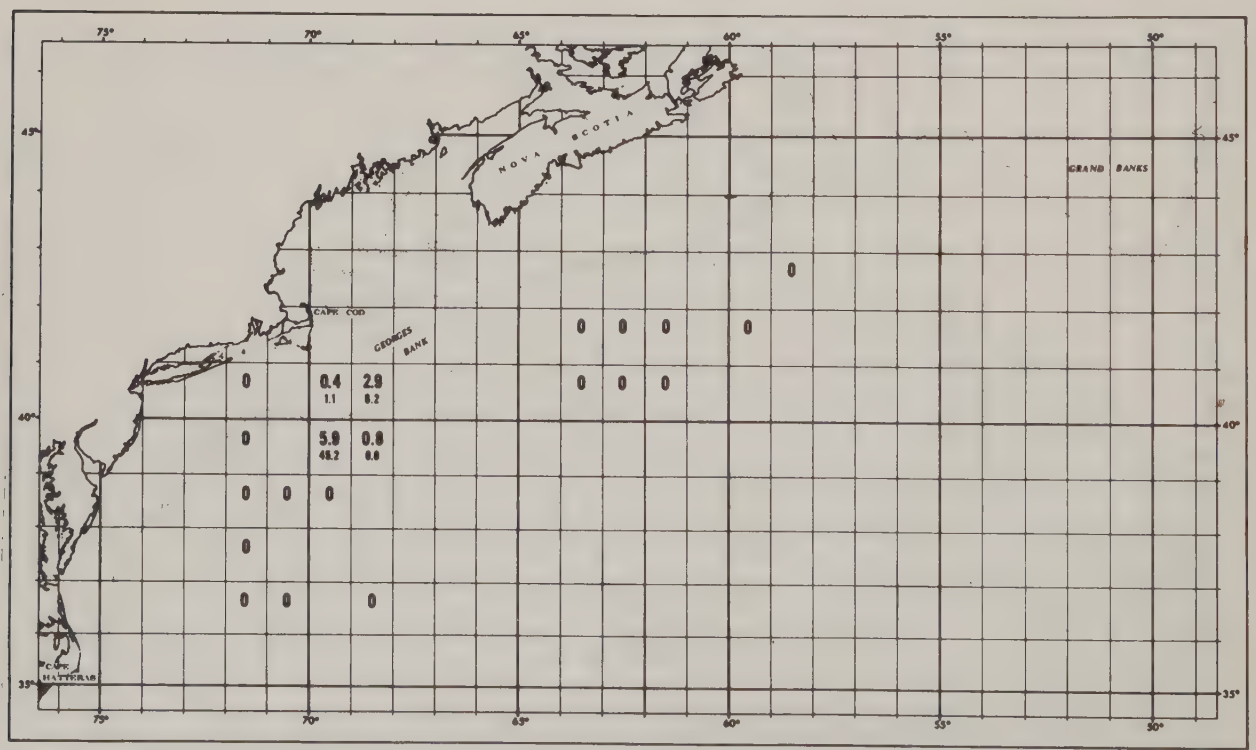

Figure 25.--Number of bluefin tuna caught in October per 100 hooks (average and maximum) within each 1° latitude and longitude square.

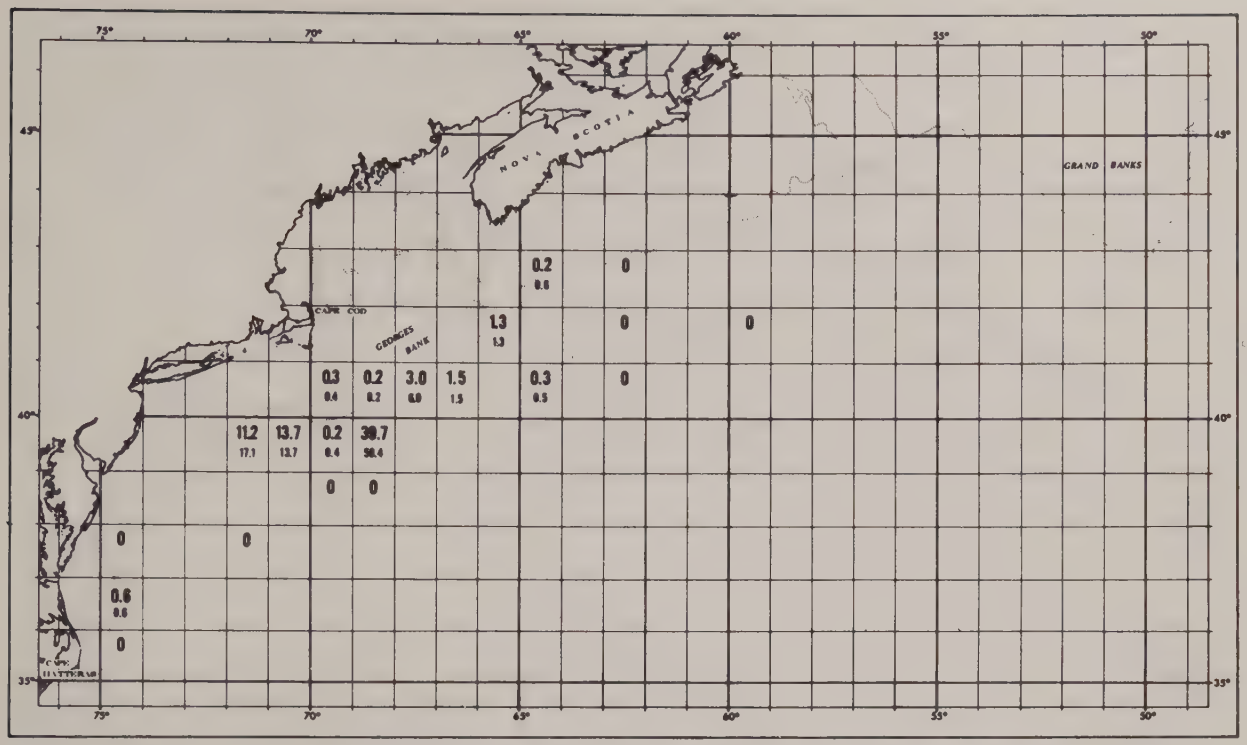

Figure 26.--Number of bluefin tuna caught in November per 100 hooks (average and maximum) within each 1° latitude and longitude square.

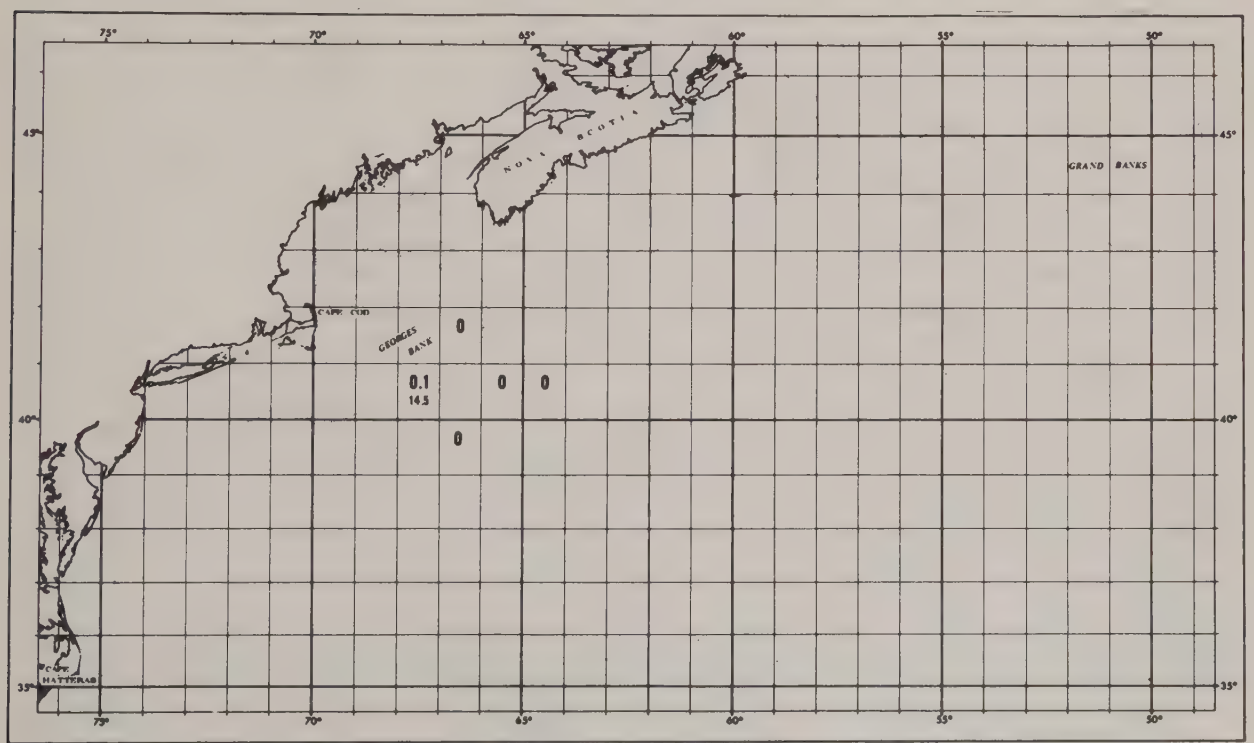

Figure 27.--Number of bluefin tuna caught in December per 100 hooks (average and maximum) within each 1° latitude and longitude square.

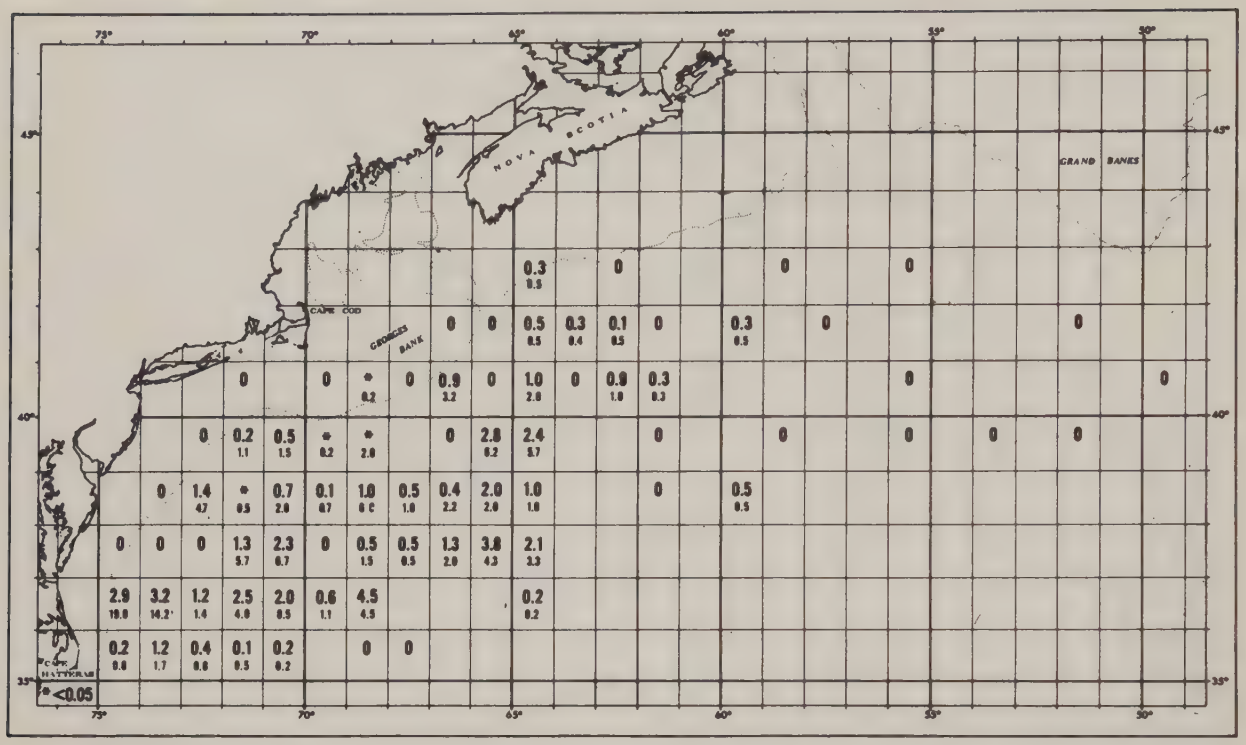

Figure 28.--Number of yellowfin tuna caught per 100 hooks (average and maximum) within each 1° latitude and longitude square.

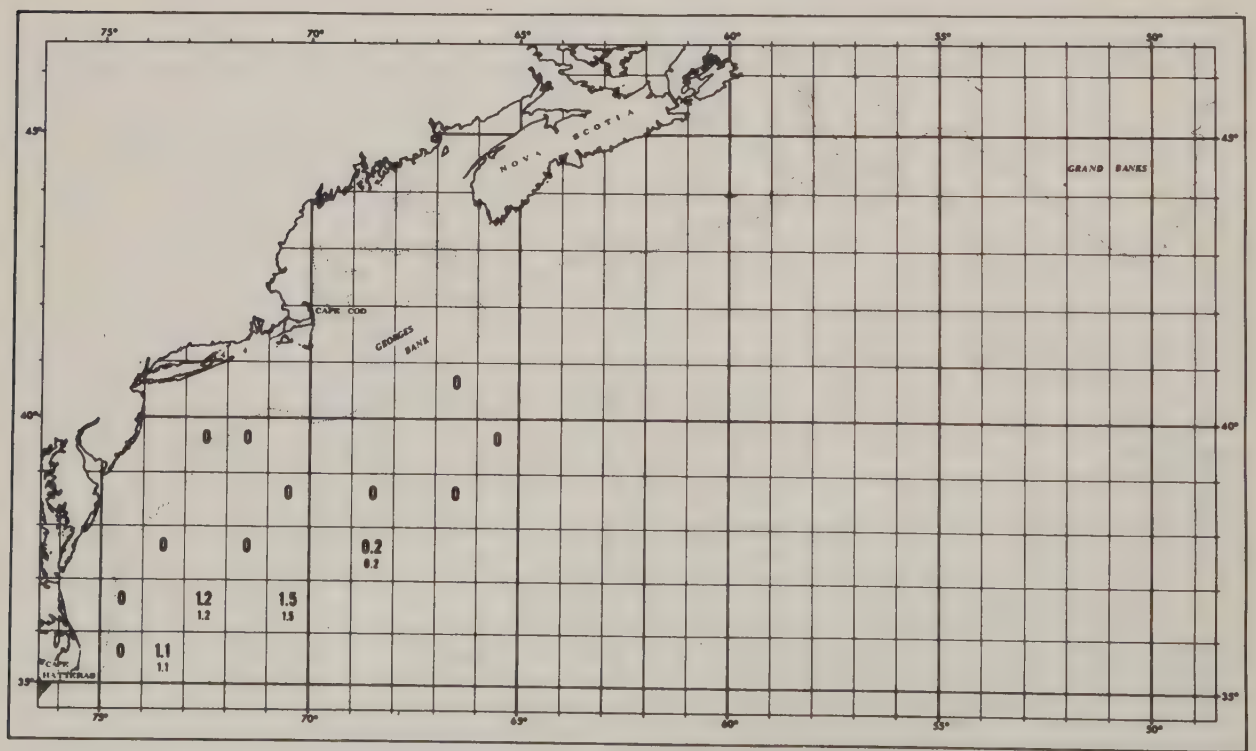

Figure 29.--Number of yellowfin tuna caught in January per 100 hooks (average and maximum) within each 1° latitude and longitude square.

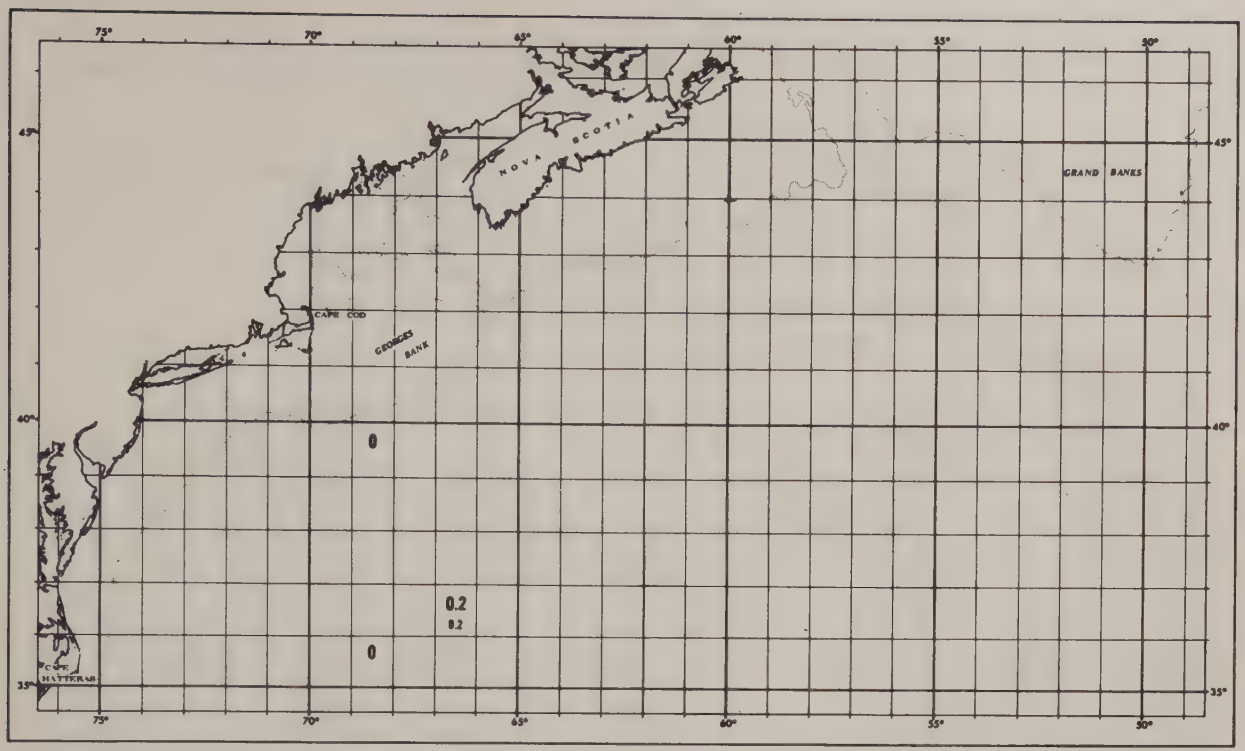

Figure 30.--Number of yellowfin tuna caught in February per 100 hooks (average and maximum) within each 1° latitude and longitude square.

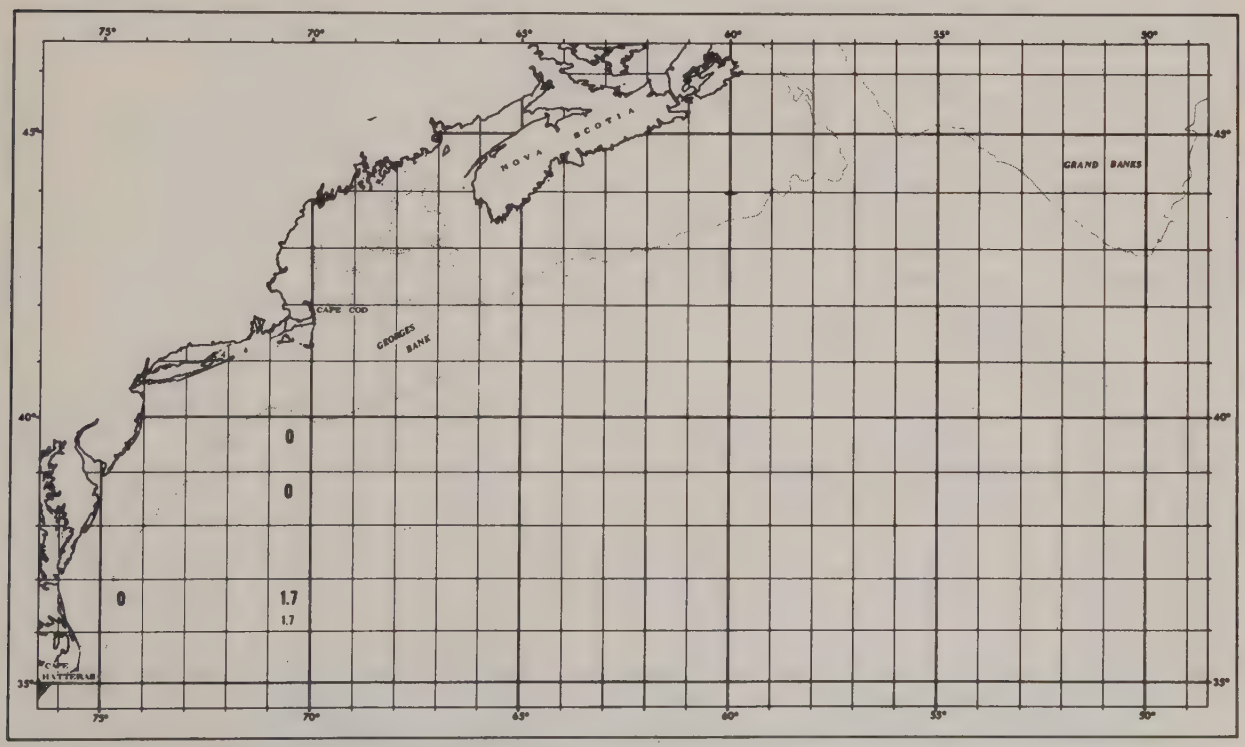

Figure 31.--Number of yellowfin tuna caught in March per 100 hooks (average and maximum) within each 1° latitude and longitude square.

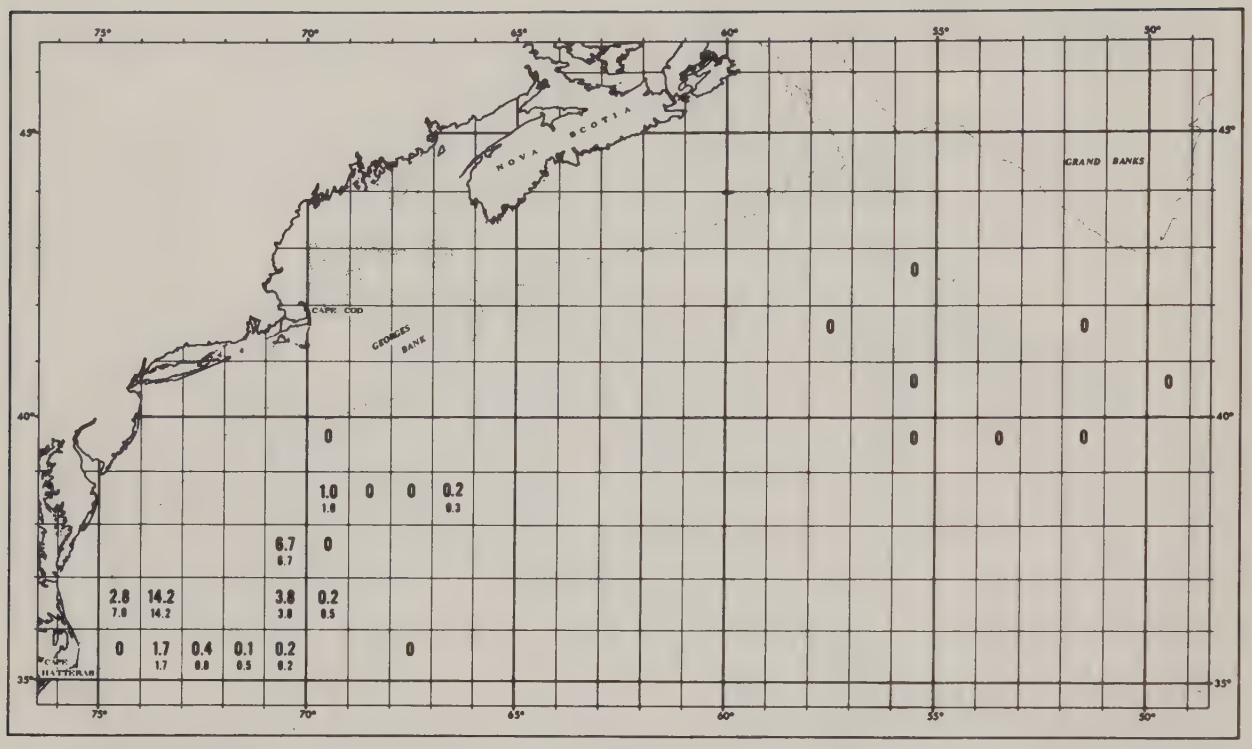

Figure 32.--Number of yellowfin tuna caught in April per 100 hooks (average and maximum) within each 1° latitude and longitude square.

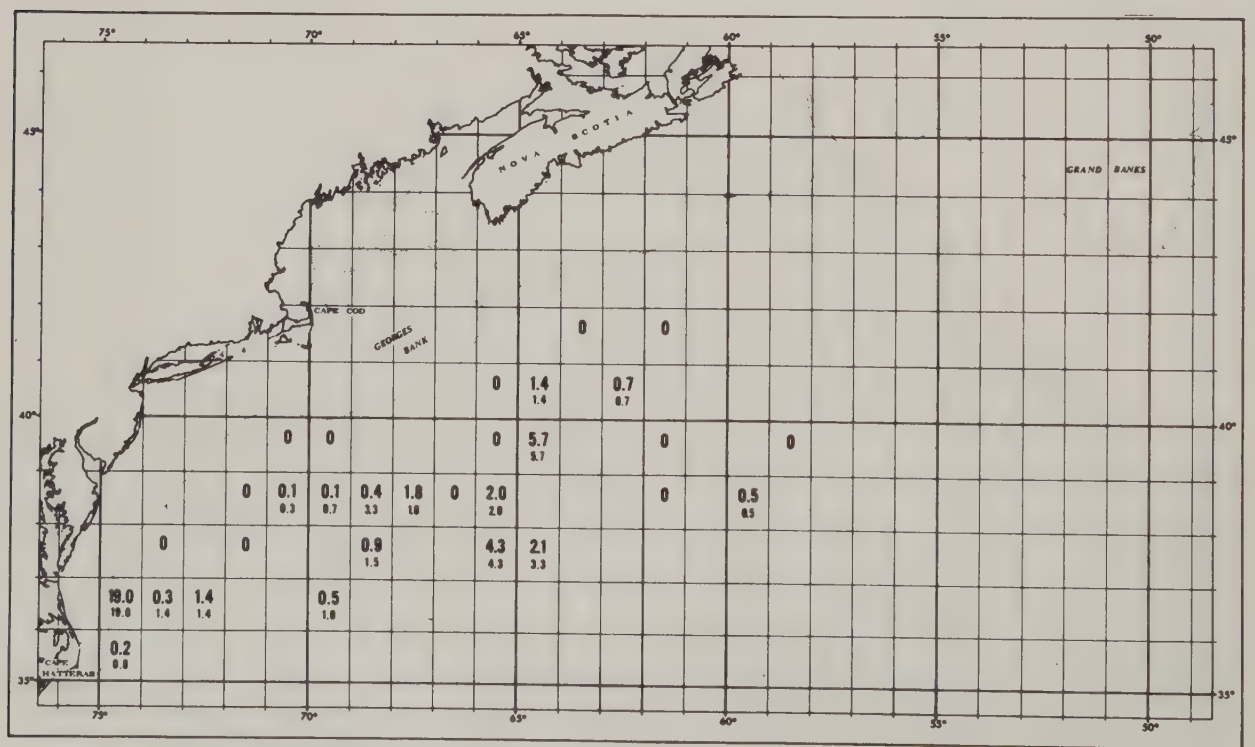

Figure 33.--Number of yellowfin tuna caught in May per 100 hooks (average and maximum) within each 1° latitude and longitude square.

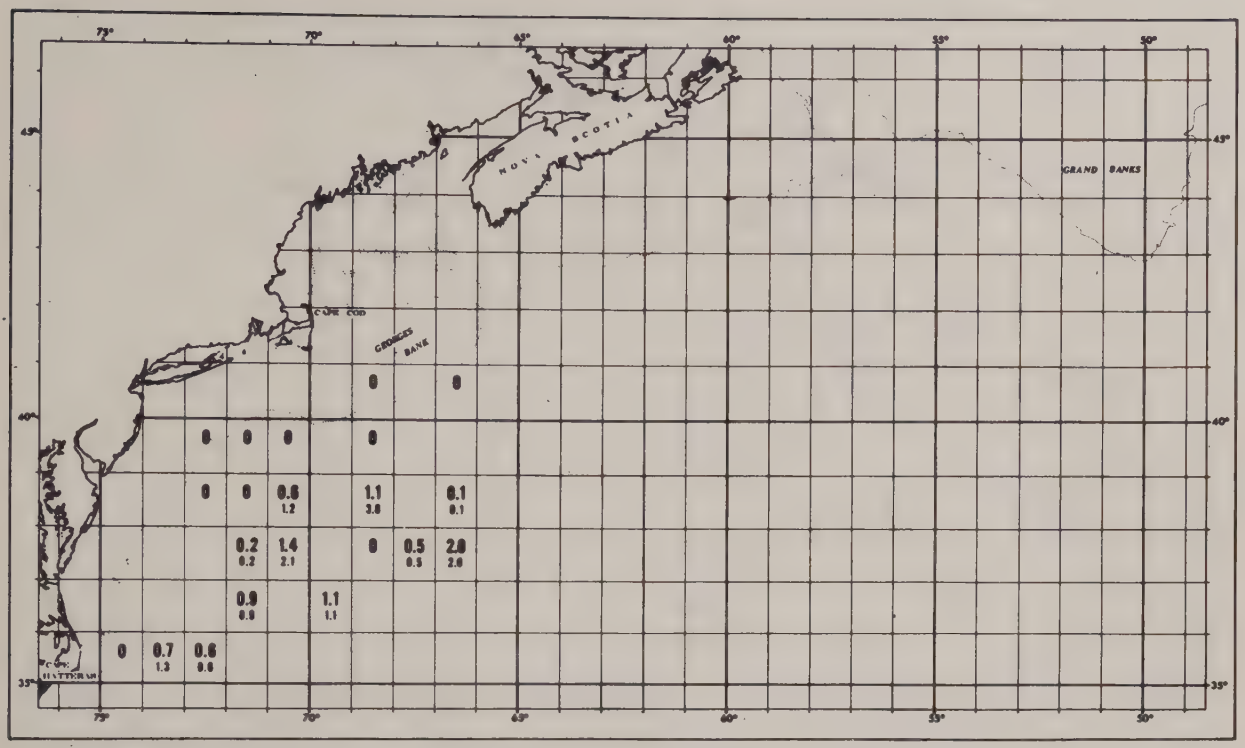

Figure 34.--Number of yellowfin tuna caught in June per 100 hooks (average and maximum) within each 1° latitude and longitude square.

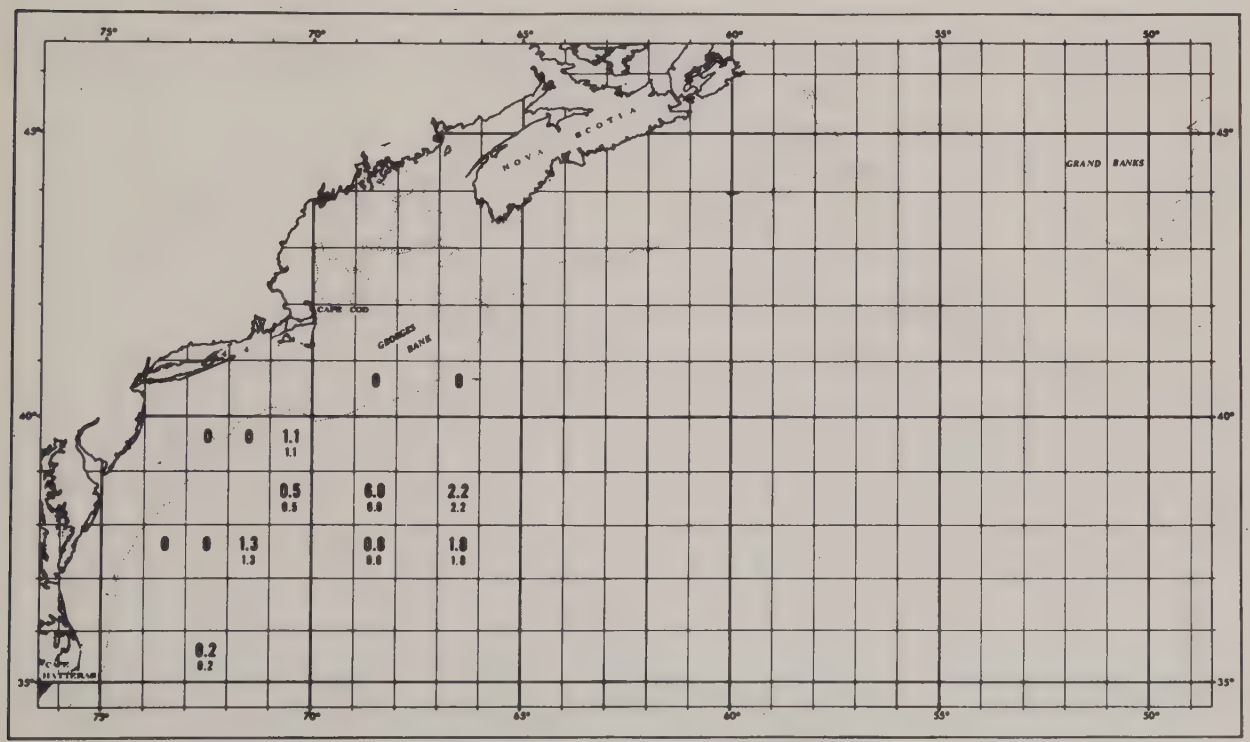

Figure 35.--Number of yellowfin tuna caught in July per 100 hooks (average and maximum) within each 1° latitude and longitude square.

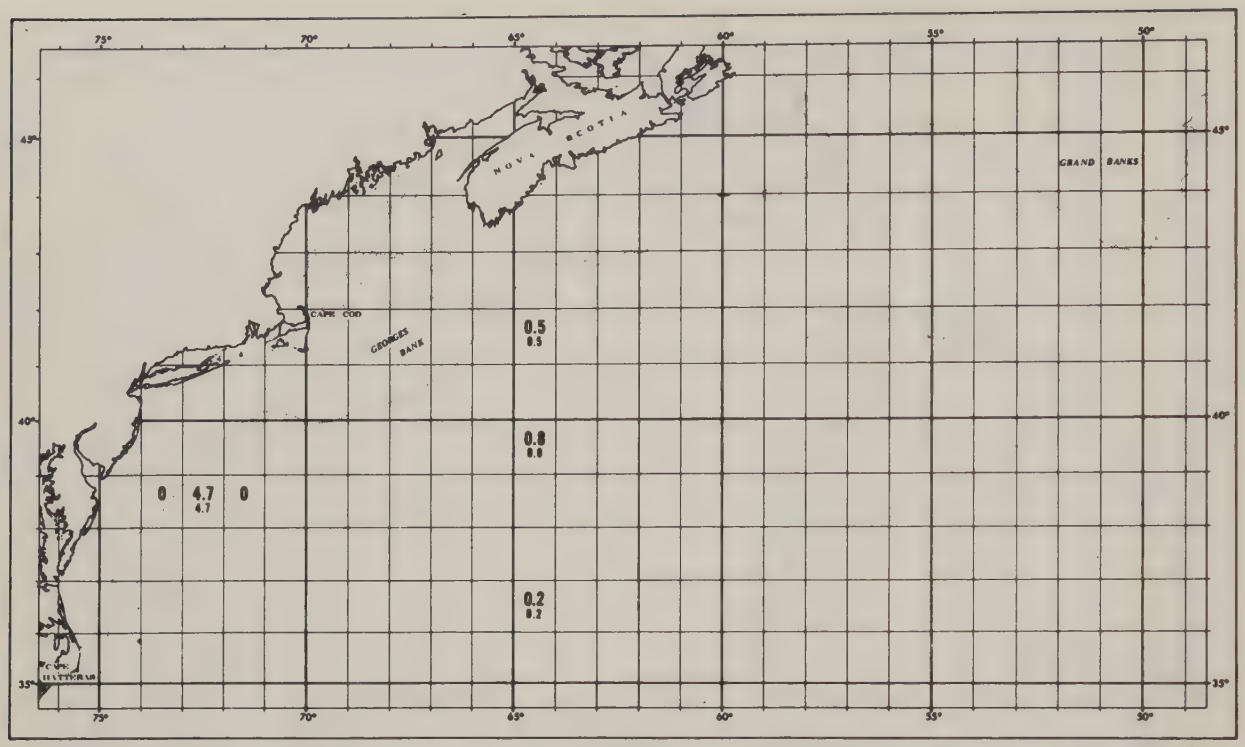

Figure 36.--Number of yellowfin tuna caught in August per 100 hooks (average and maximum) within each 1° latitude and longitude square.

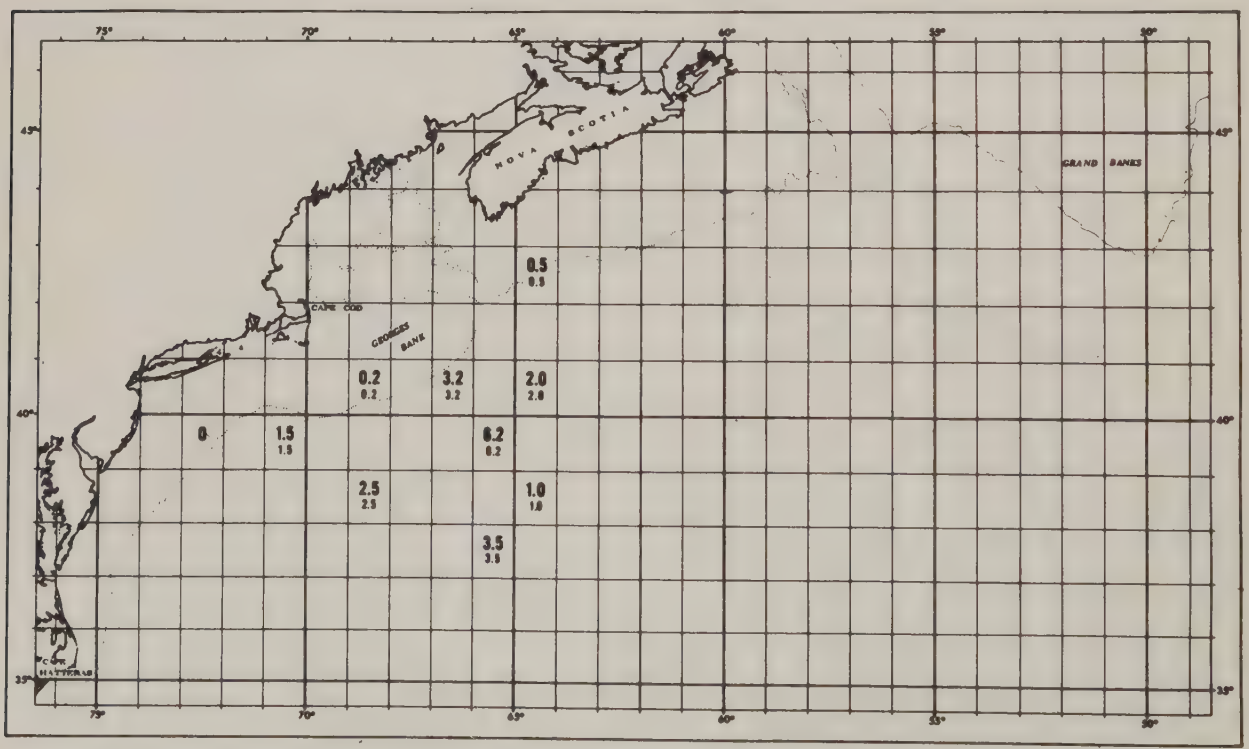

Figure 37.--Number of yellowfin tuna caught in September per 100 hooks (average and maximum) within each 1° latitude and longitude square.

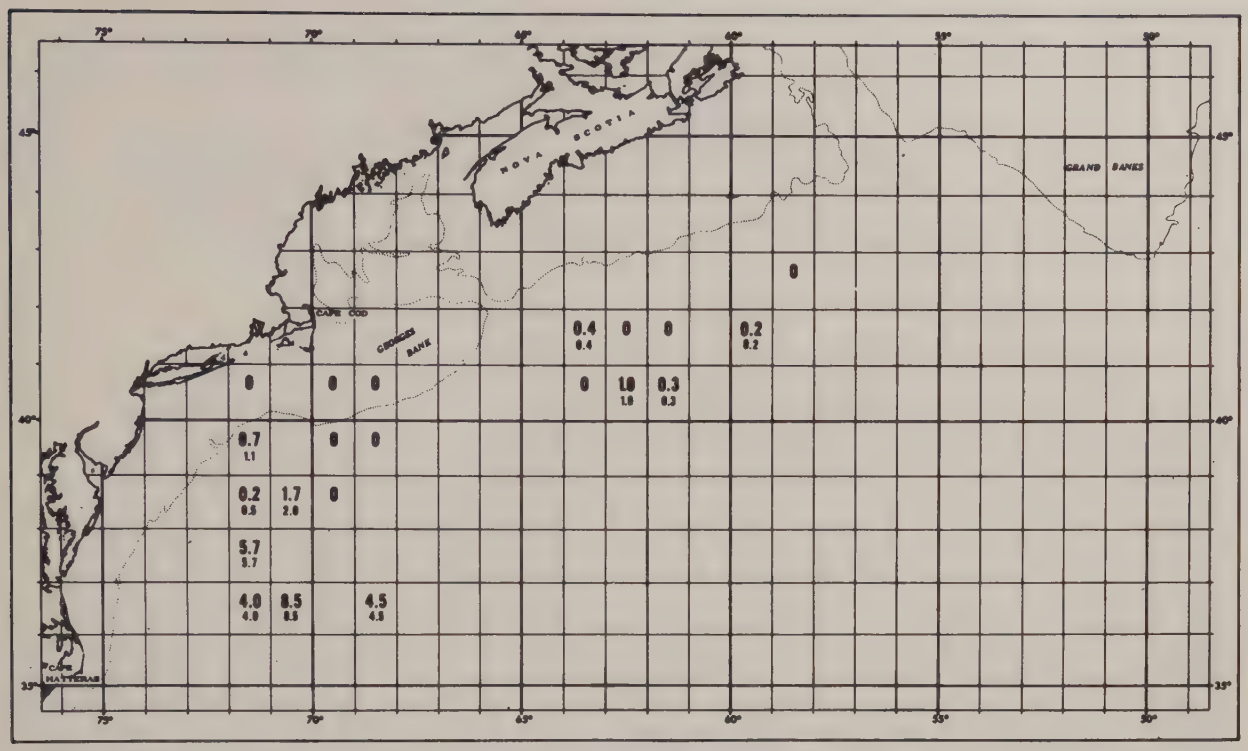

Figure 38.--Number of yellowfin tuna caught in October per 100 hooks (average and maximum) within each 1° latitude and longitude square.

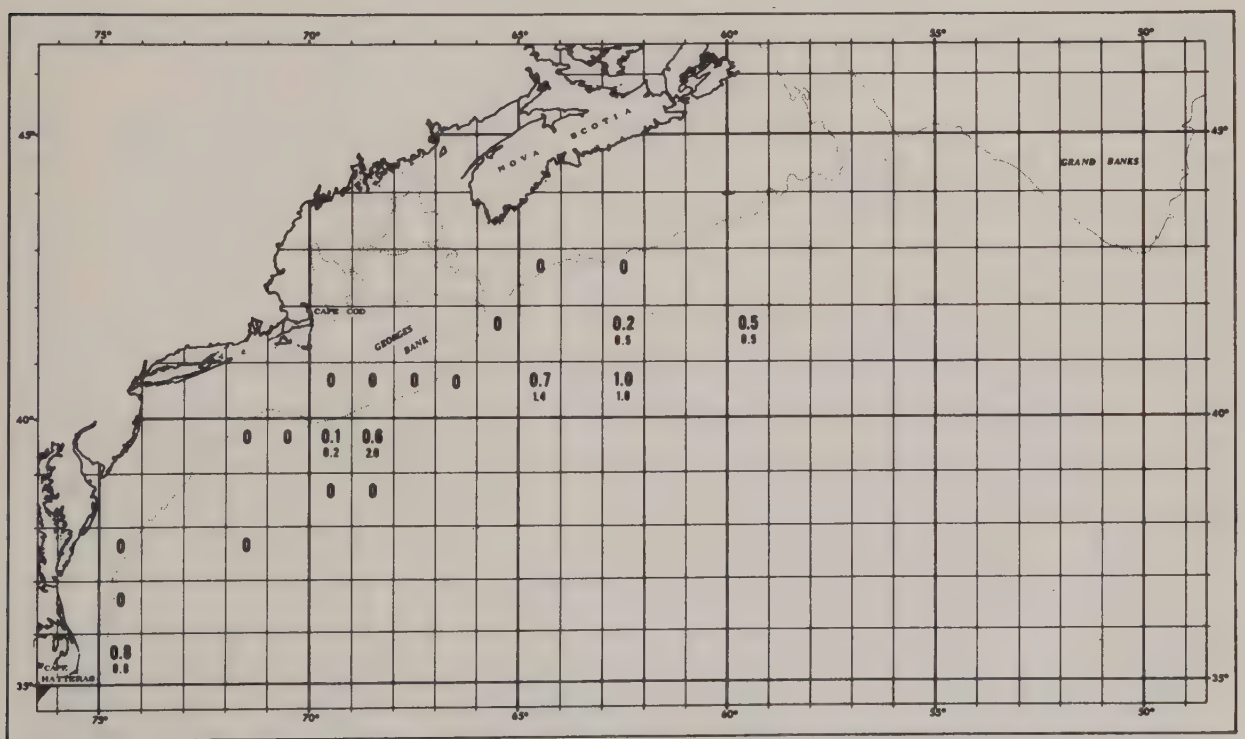

Figure 39.--Number of yellowfin tuna caught in November per 100 hooks (average and maximum) within each 1° latitude and longitude square.

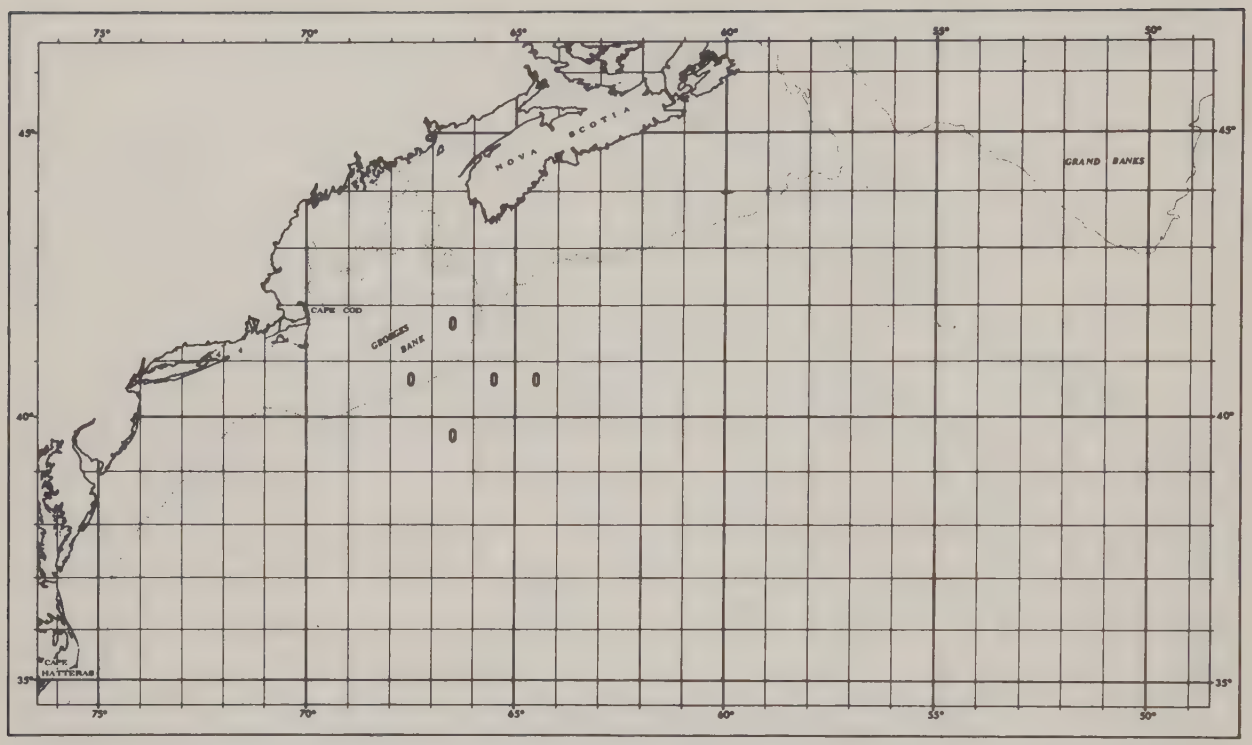

Figure 40.--Number of yellowfin tuna caught in December per 100 hooks (average and maximum) within each 1° latitude and longitude square.

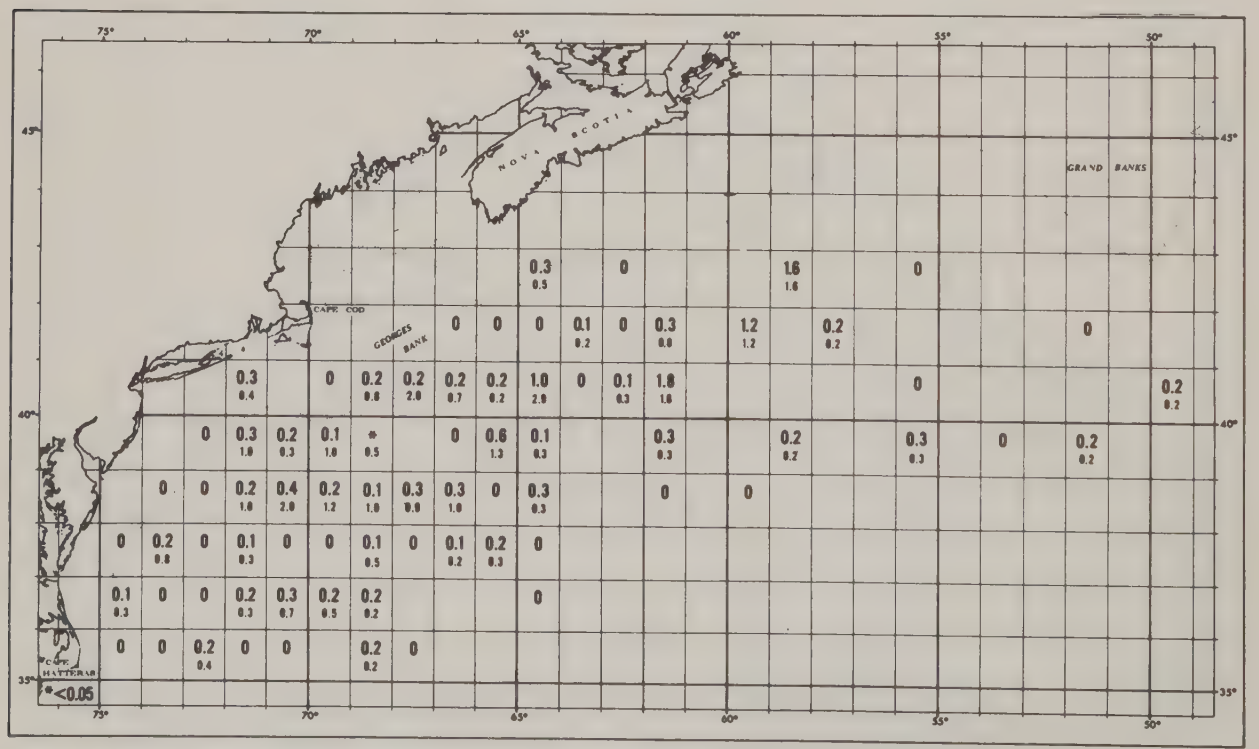

Figure 41.--Number of albacore tuna caught per 100 hooks (average and maximum) within each 1° latitude and longitude square.

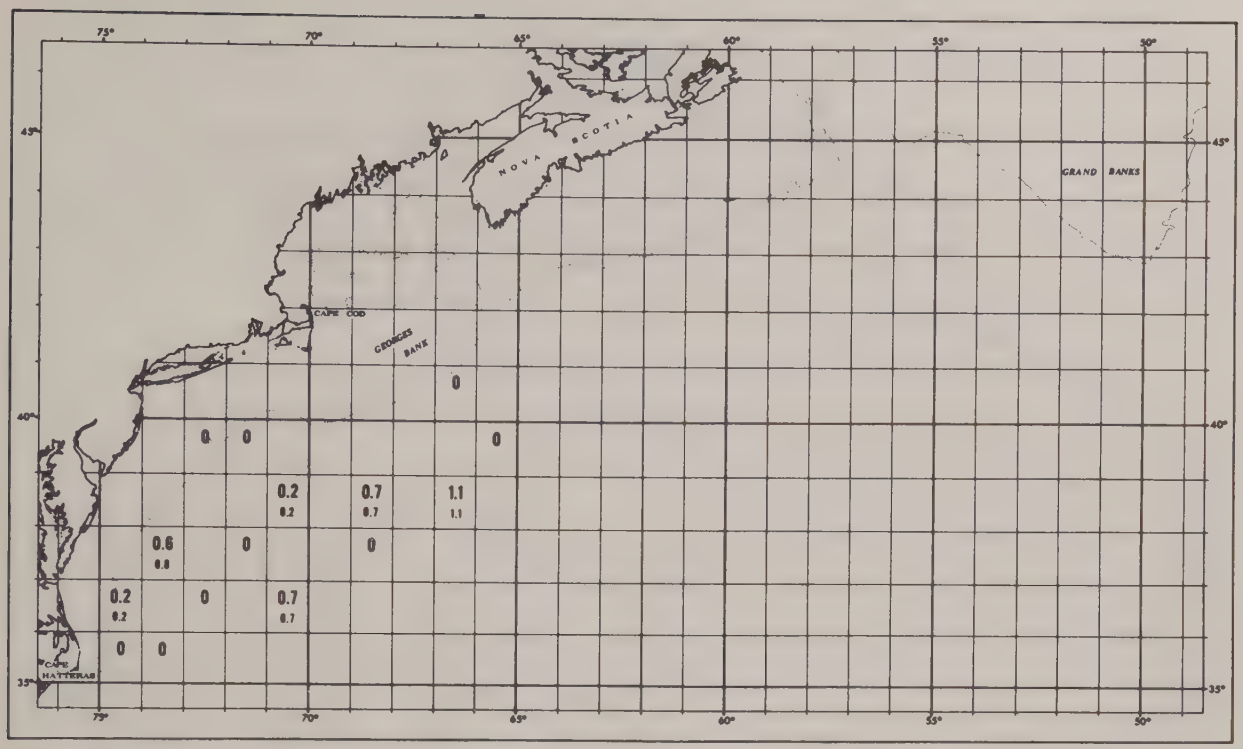

Figure 42.--Number of albacore tuna caught in January per 100 hooks (average and maximum) within each 1° latitude and longitude square.

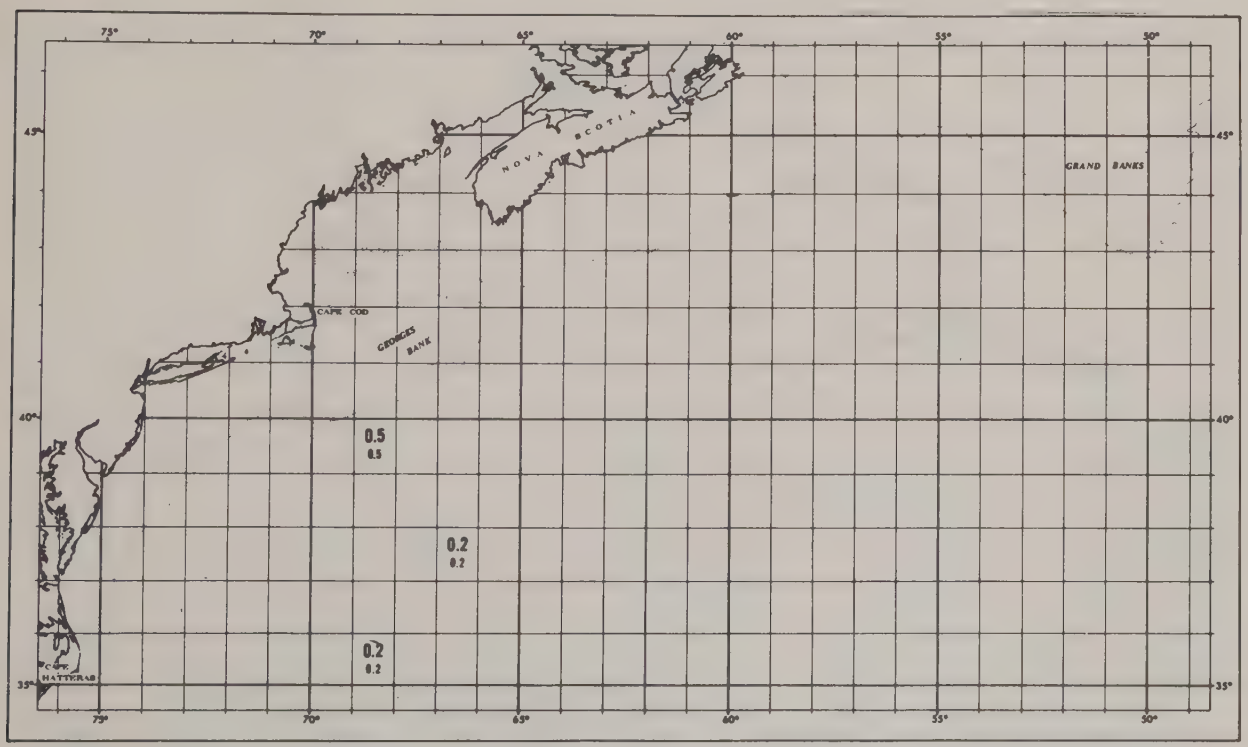

Figure 43.--Number of albacore tuna caught in February per 100 hooks (average and maximum) within each 1° latitude and longitude square.

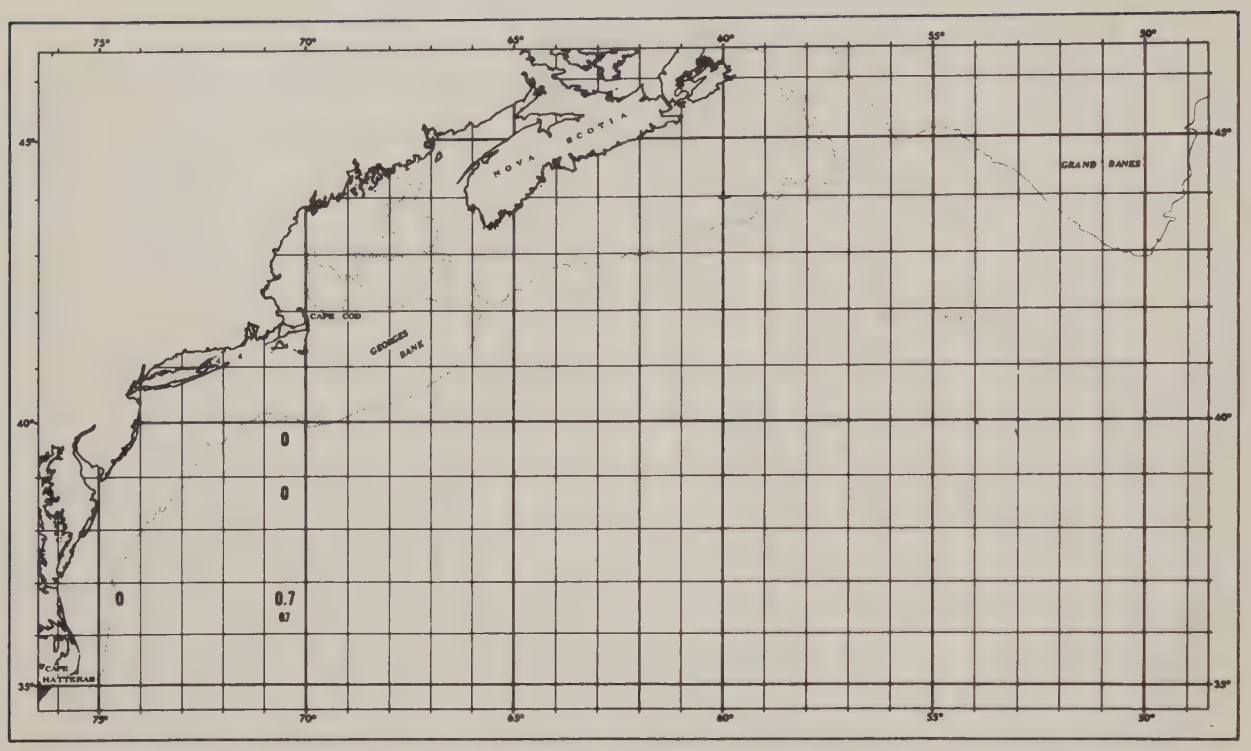

Figure 44.--Number of albacore tuna caught in March per 100 hooks (average and maximum) within each 1° latitude and longitude square.

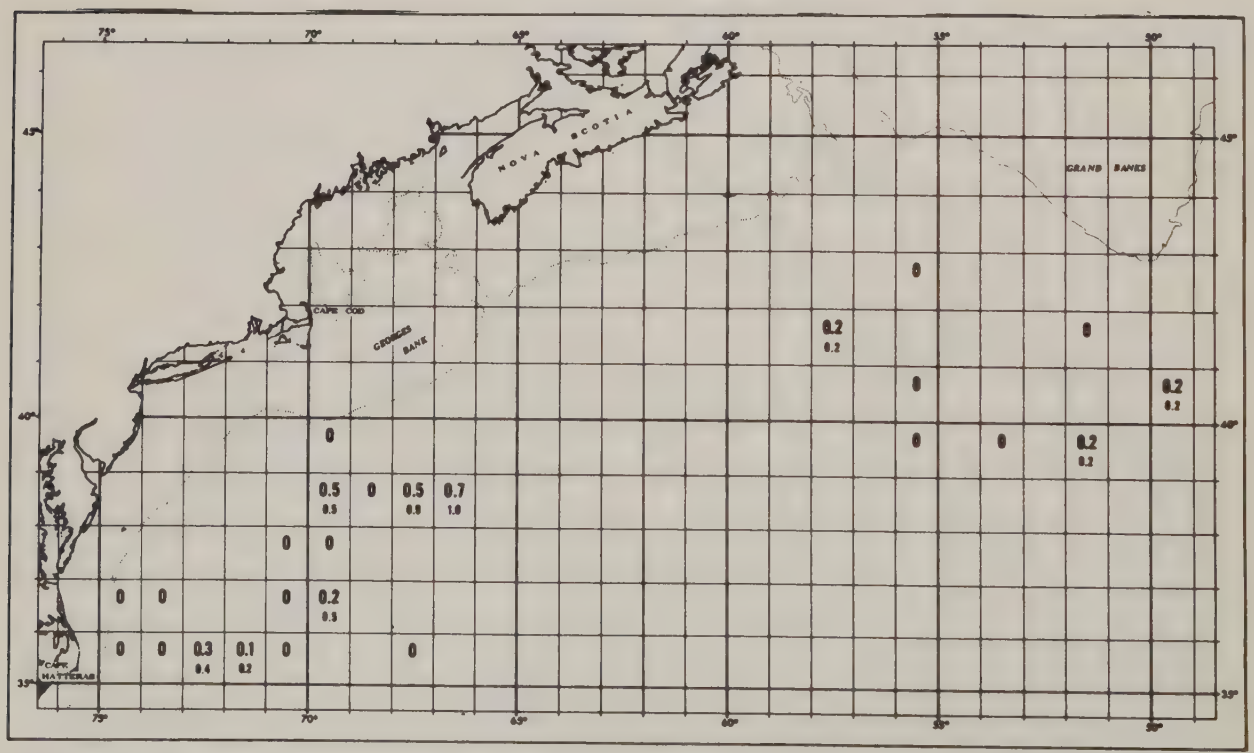

Figure 45.--Number of albacore tuna caught in April per 100 hooks (average and maximum) within each 1° latitude and longitude square.

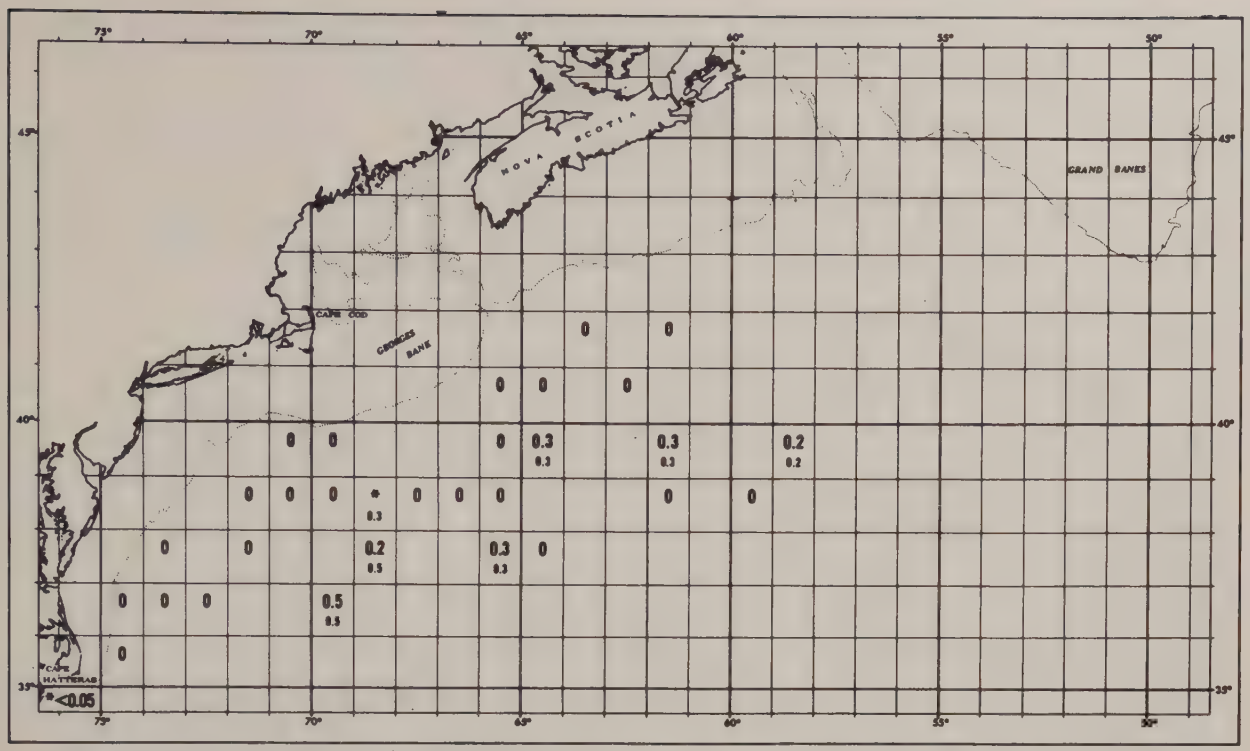

Figure 46.--Number of albacore tuna caught in May per 100 hooks (average and maximum) within each 1° latitude and longitude square.

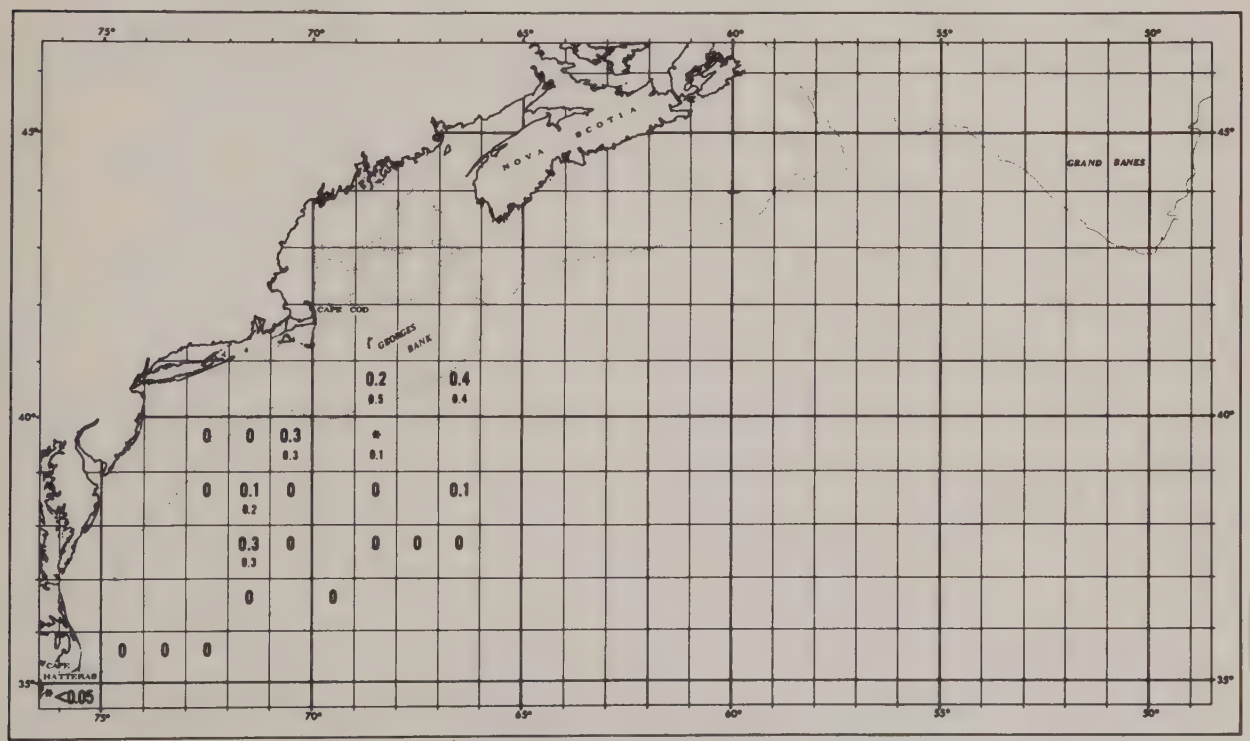

Figure 47.--Number of albacore tuna caught in June per 100 hooks (average and maximum) within each 1° latitude and longitude square.

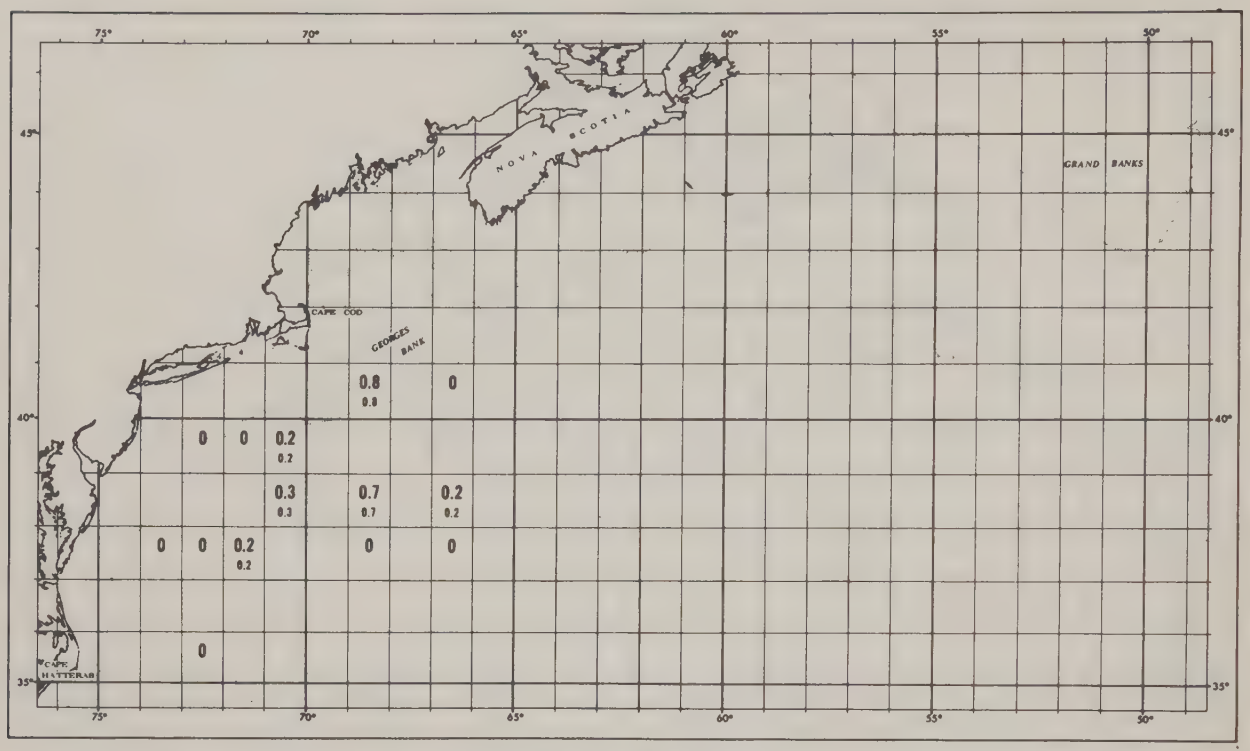

Figure 48.--Number of albacore tuna caught in July per 100 hooks (average and maximum) within each 1° latitude and longitude square.

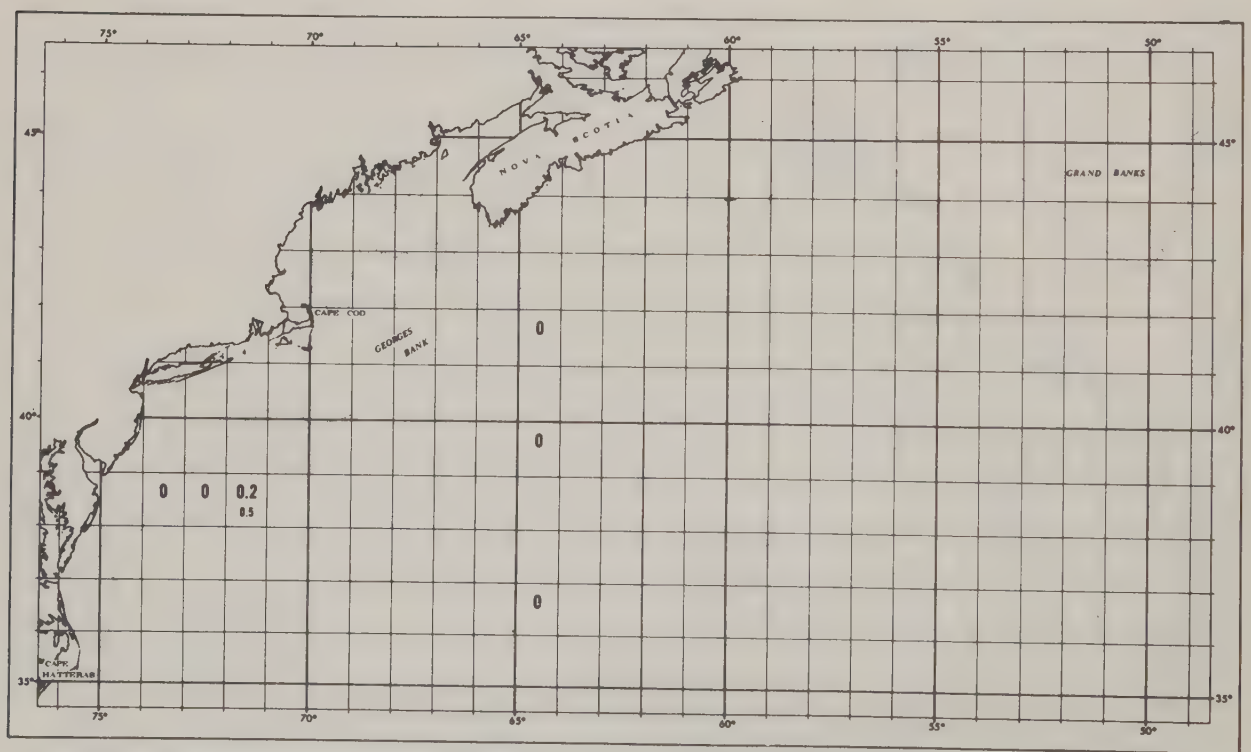

Figure 49.--Number of albacore tuna caught in August per 100 hooks (average and maximum) within each 1° latitude and longitude square.

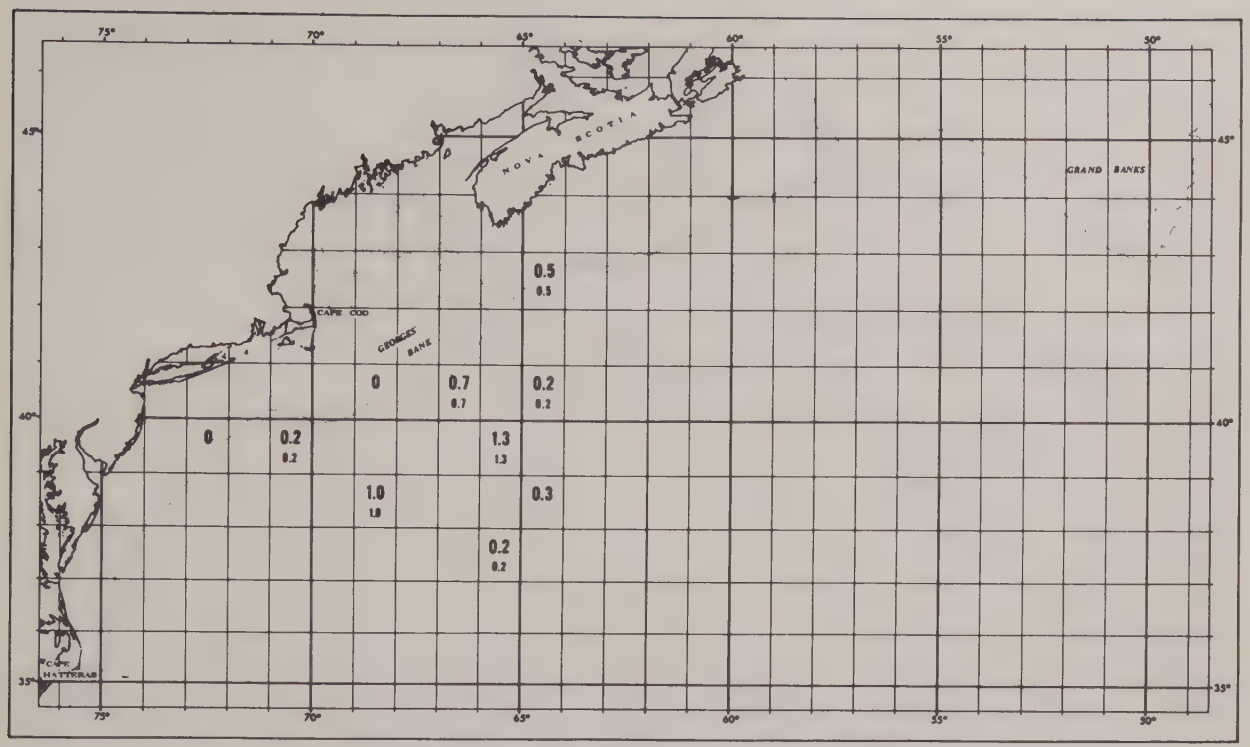

Figure 50.--Number of albacore tuna caught in September per 100 hooks (average and maximum) within each 1° latitude and longitude square.

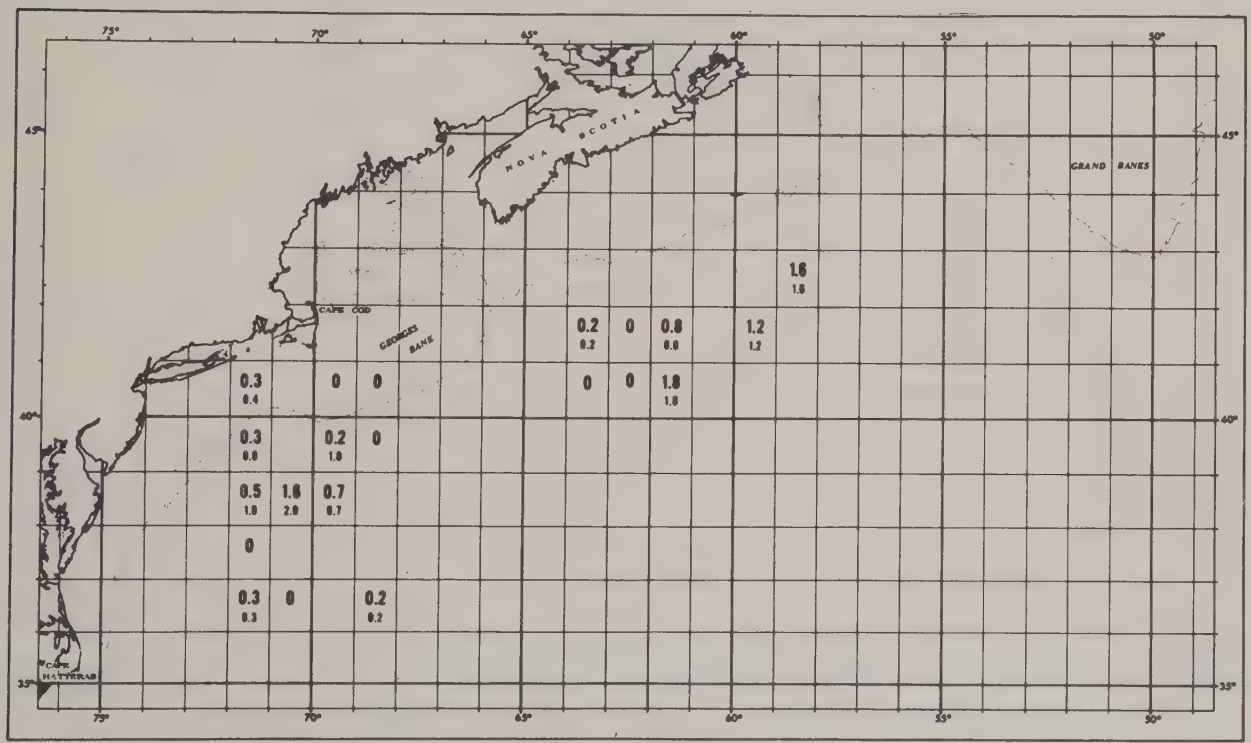

Figure 51.--Number of albacore tuna caught in October per 100 hooks (average and maximum) within each 1° latitude and longitude square.

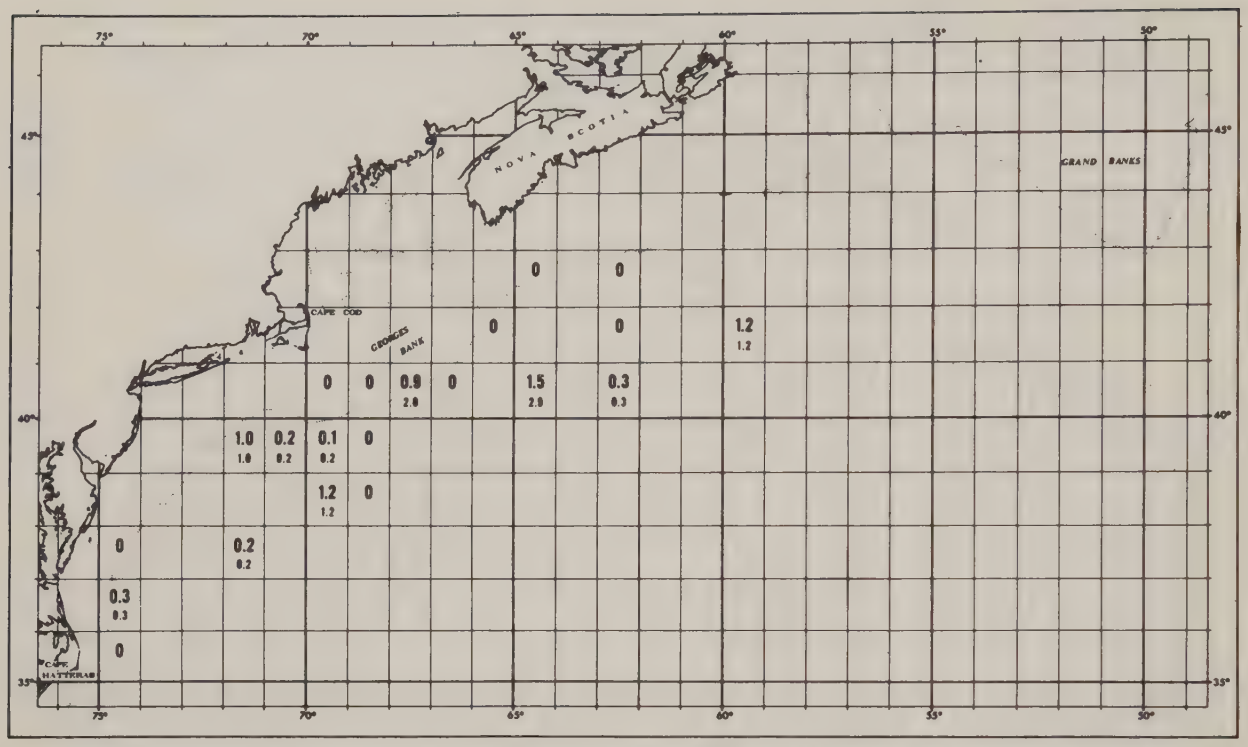

Figure 52.--Number of albacore tuna caught in November per 100 hooks (average and maximum) within each 1° latitude and longitude square.

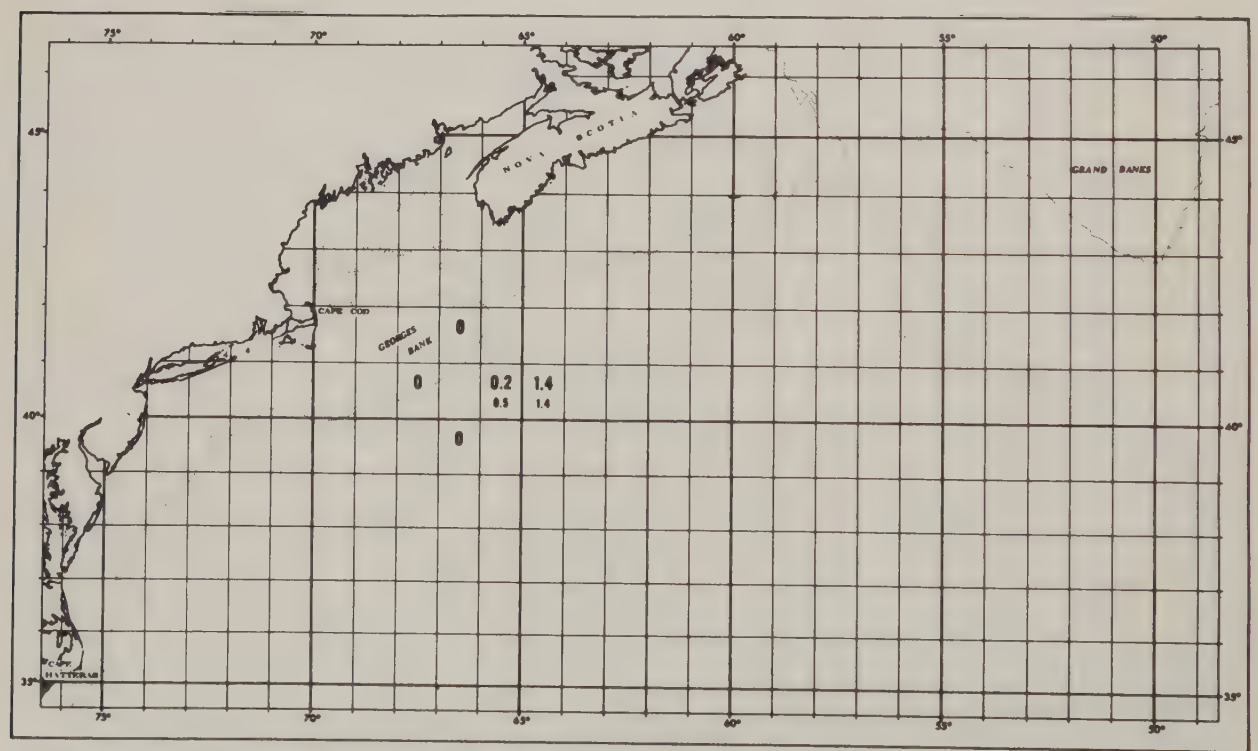

Figure 53.--Number of albacore tuna caught in December per 100 hooks (average and maximum) within each 1° latitude and longitude square.

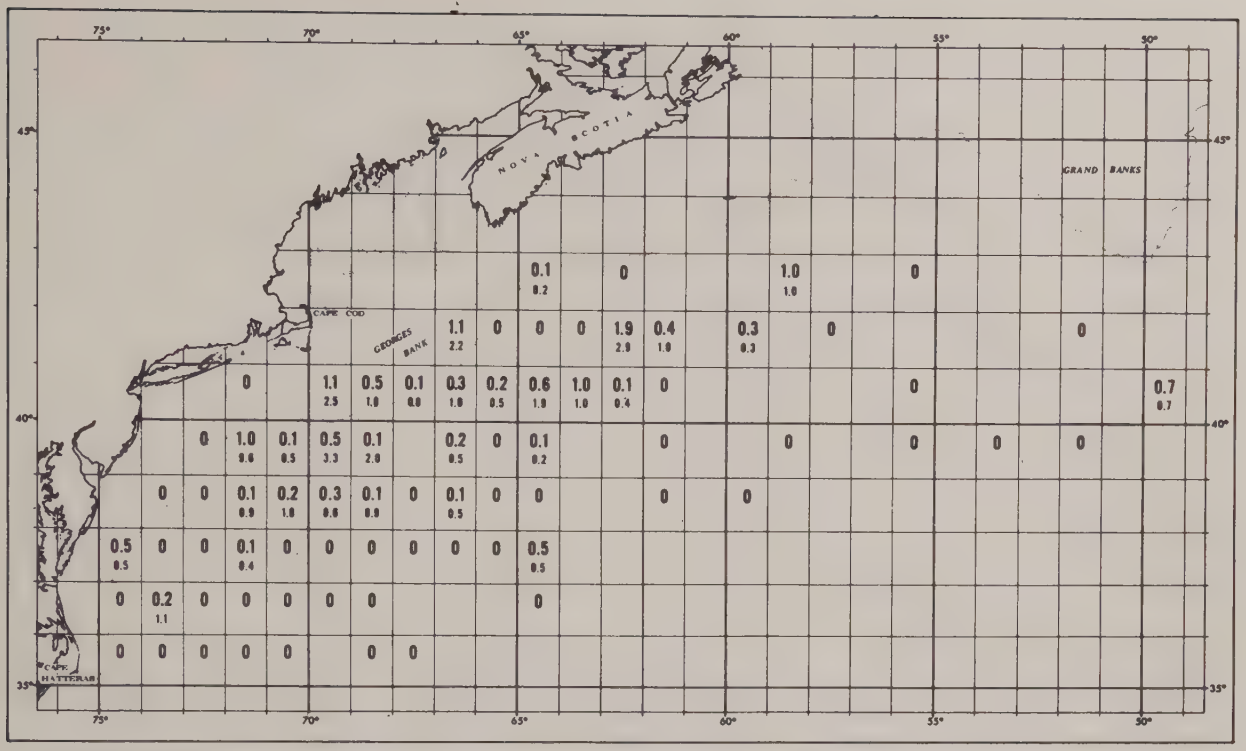

Figure 54.--Number of bigeye tuna caught per 100 hooks (average and maximum) within each 1° latitude and longitude square.

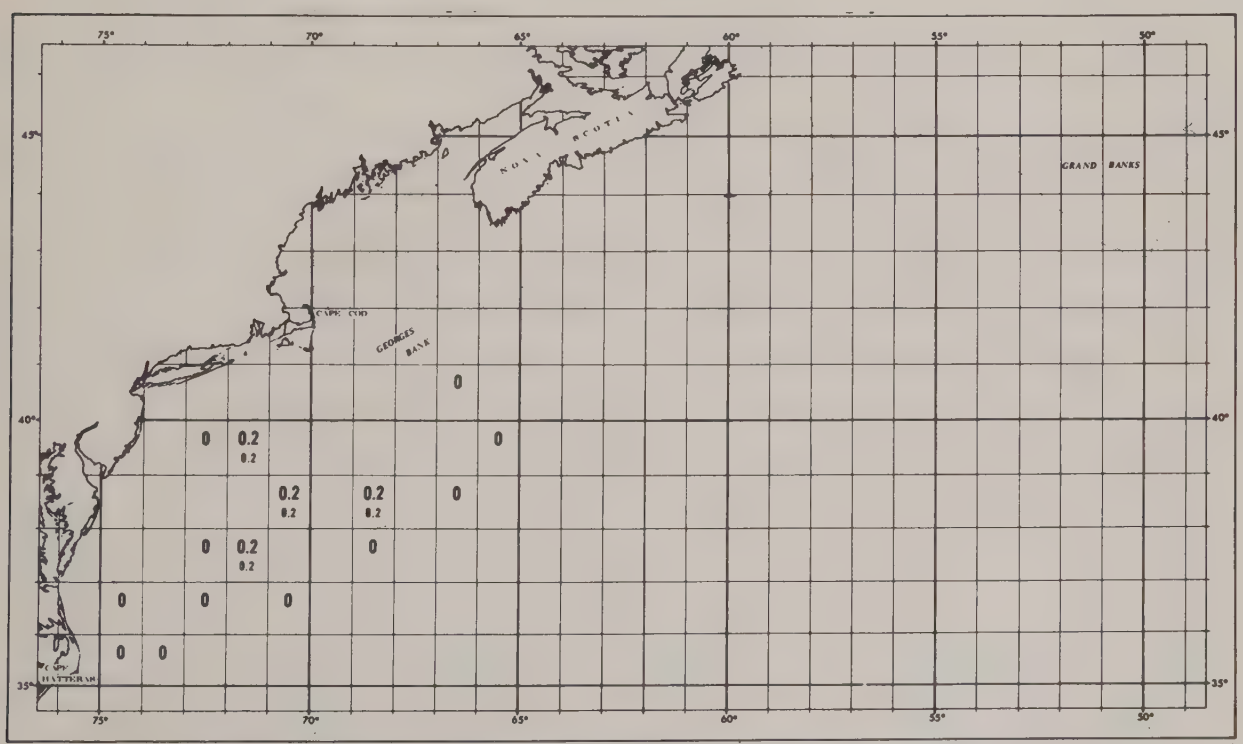

Figure 55.--Number of bigeye tuna caught in January per 100 hooks (average and maximum) within each 1° latitude and longitude square.

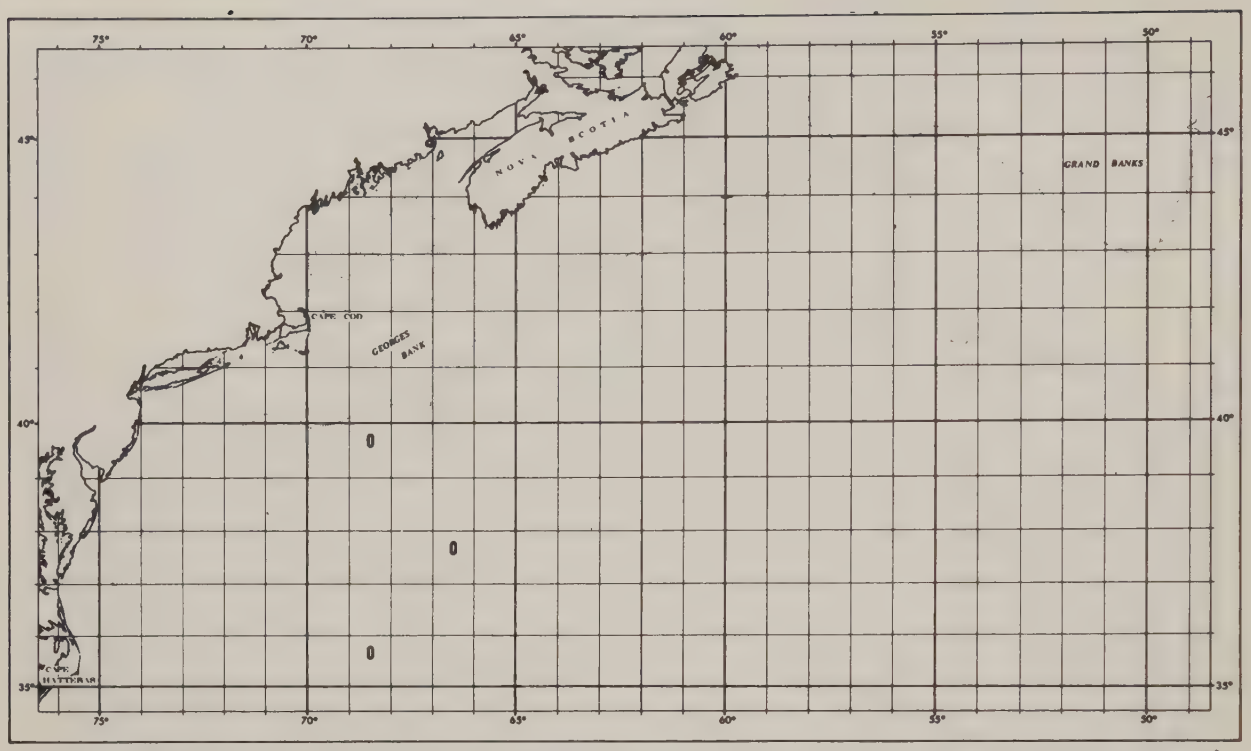

Figure 56.--Number of bigeye tuna caught in February per 100 hooks (average and maximum) within each 1° latitude and longitude square.

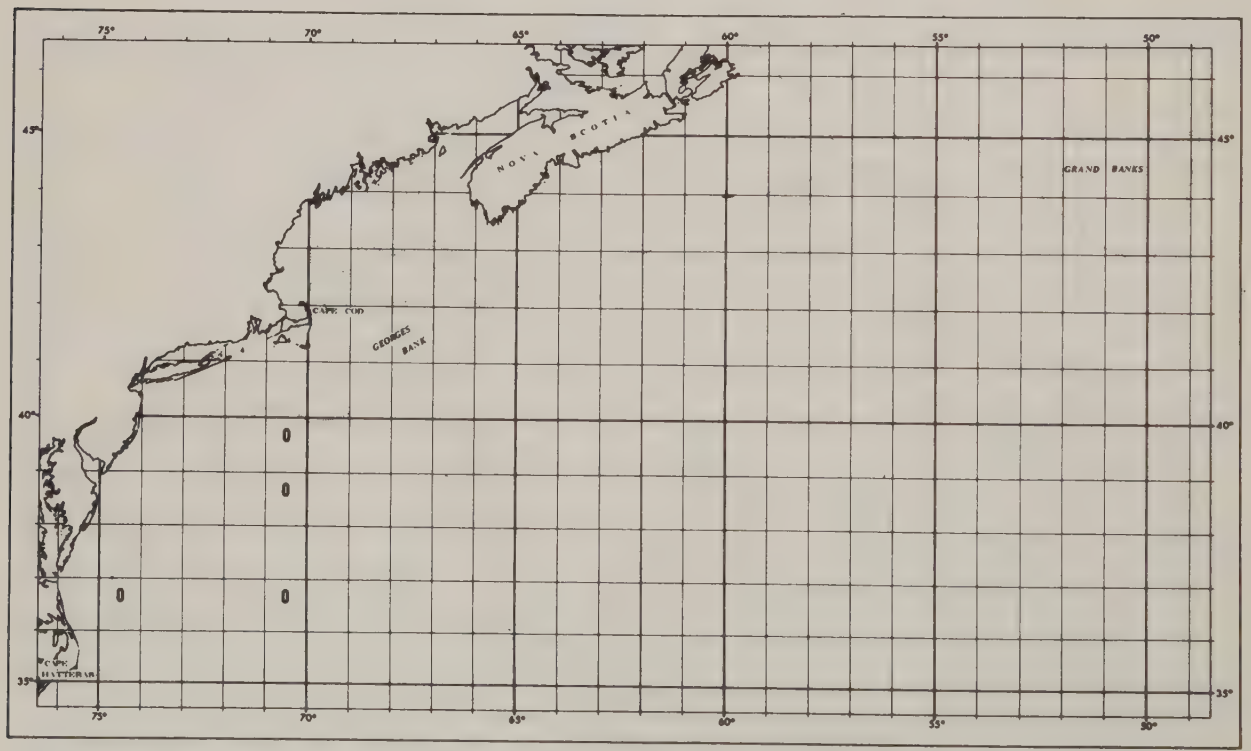

Figure 57.--Number of bigeye tuna caught in March per 100 hooks (average and maximum) within each 1° latitude and longitude square.

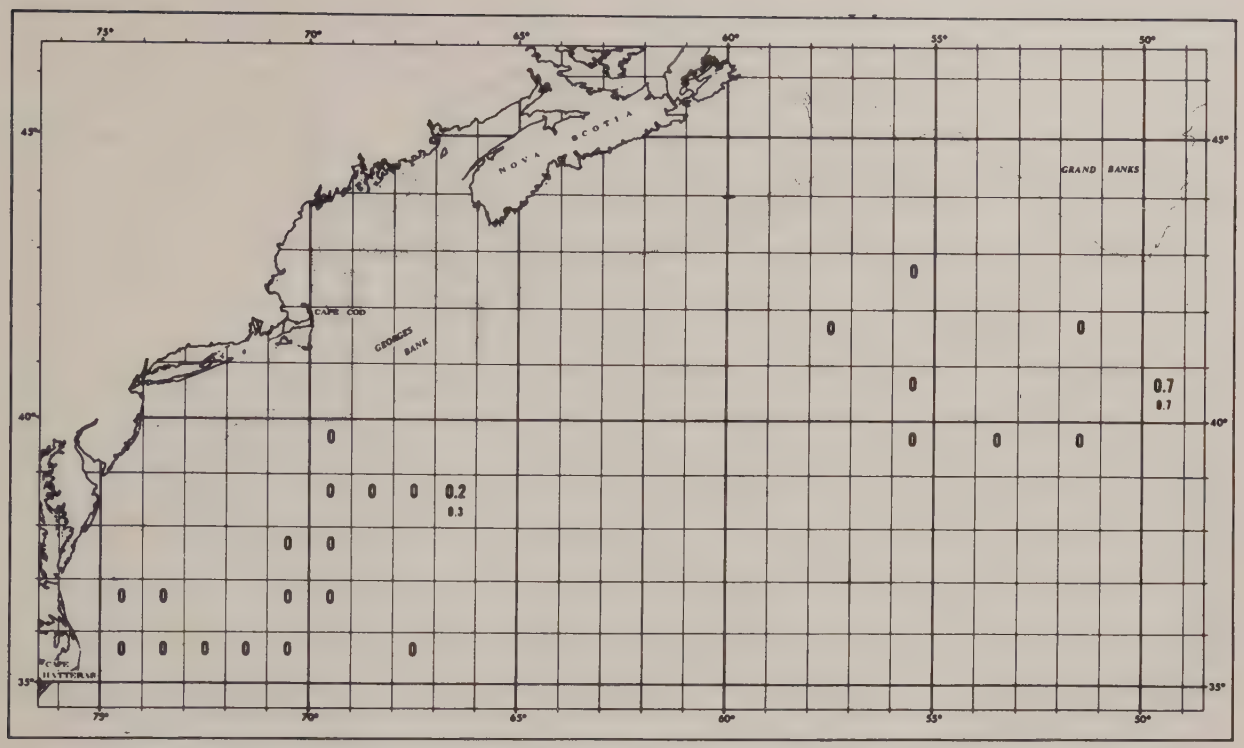

Figure 58.--Number of bigeye tuna caught in April per 100 hooks (average and maximum) within each 1° latitude and longitude square.

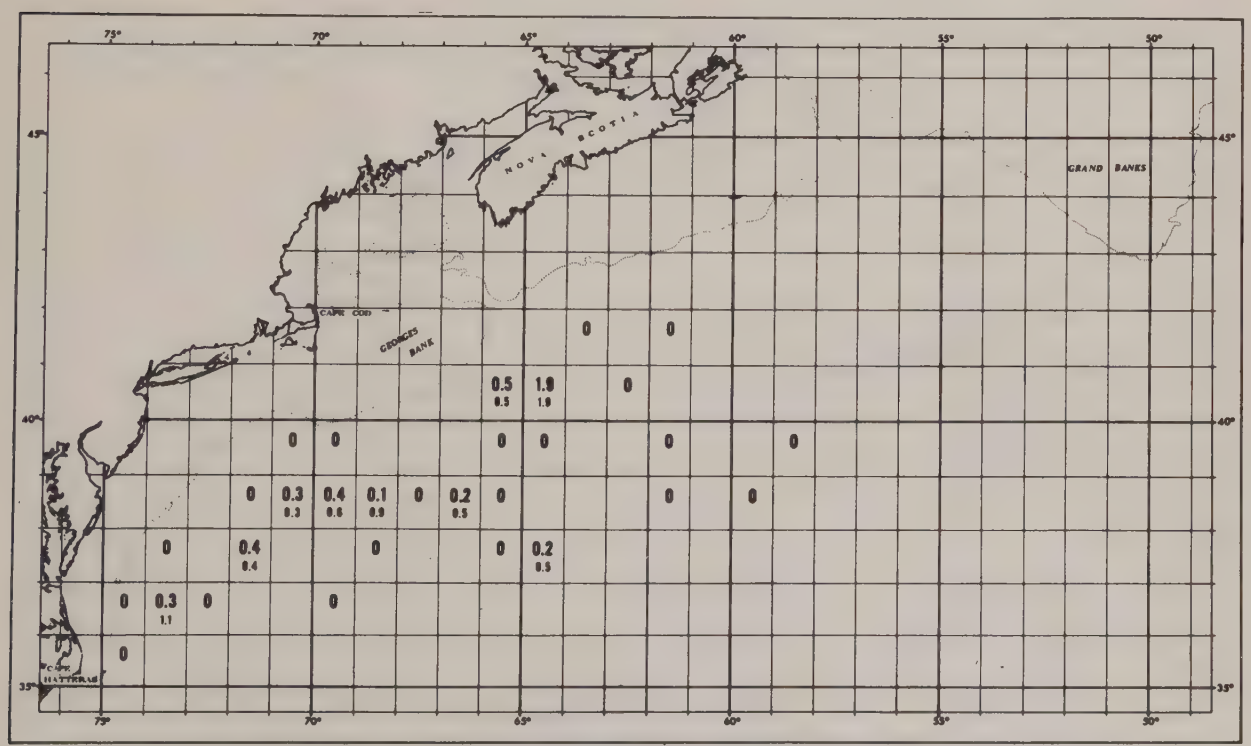

Figure 59.--Number of bigeye tuna caught in May per 100 hooks (average and maximum) within each 1° latitude and longitude square.

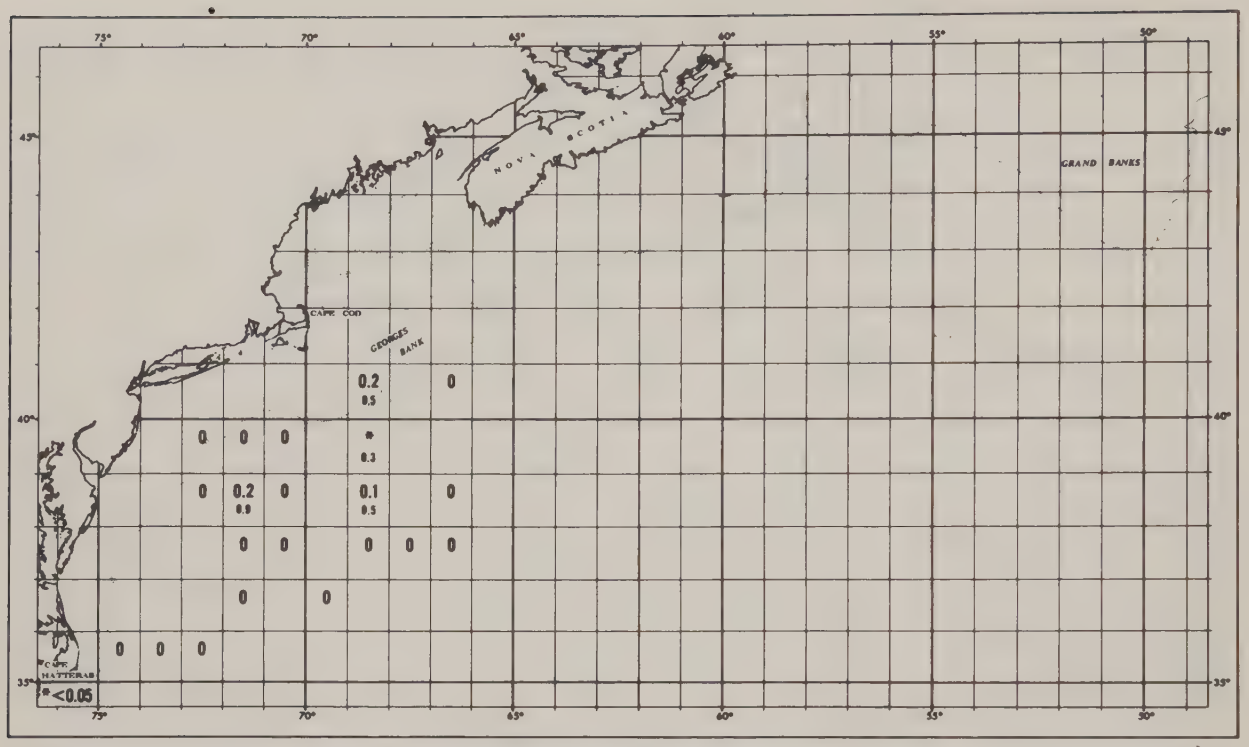

Figure 60.--Number of bigeye tuna caught in June per 100 hooks (average and maximum) within each 1° latitude and longitude square.

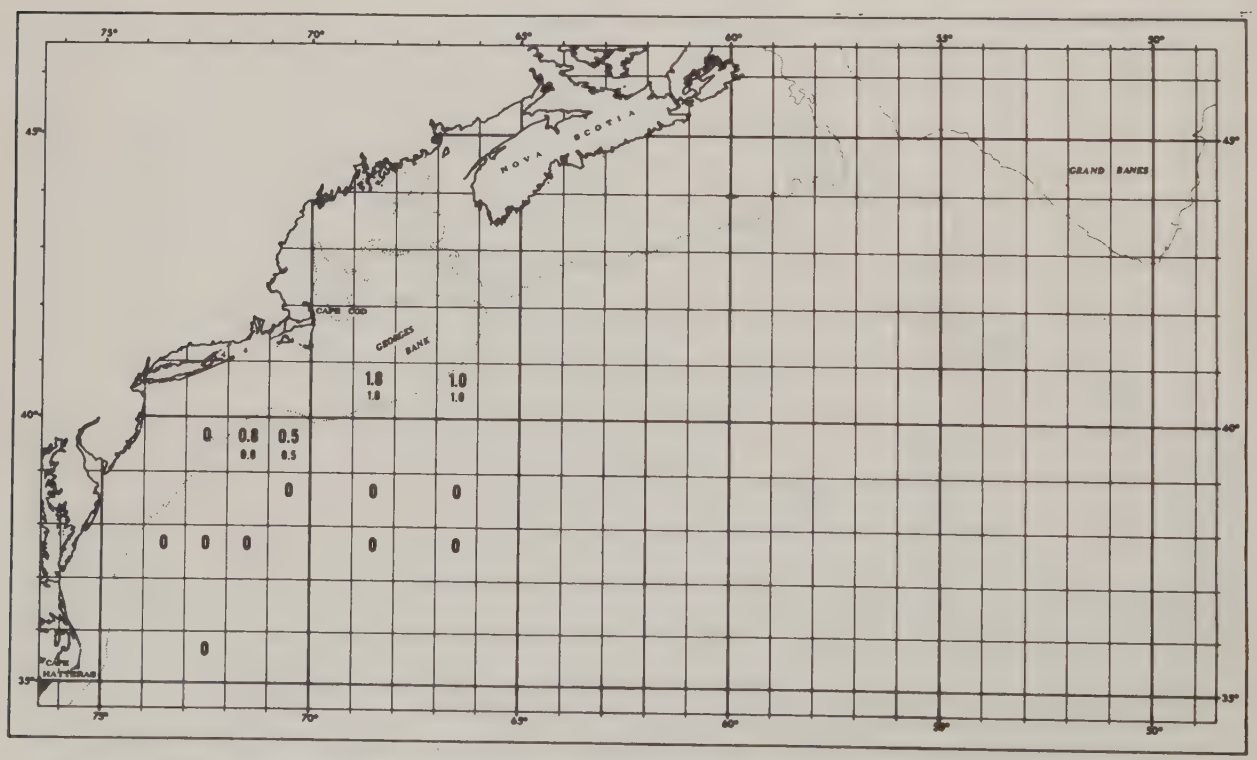

Figure 61.--Number of bigeye tuna caught in July per 100 hooks (average and maximum) within each 1° latitude and longitude square.

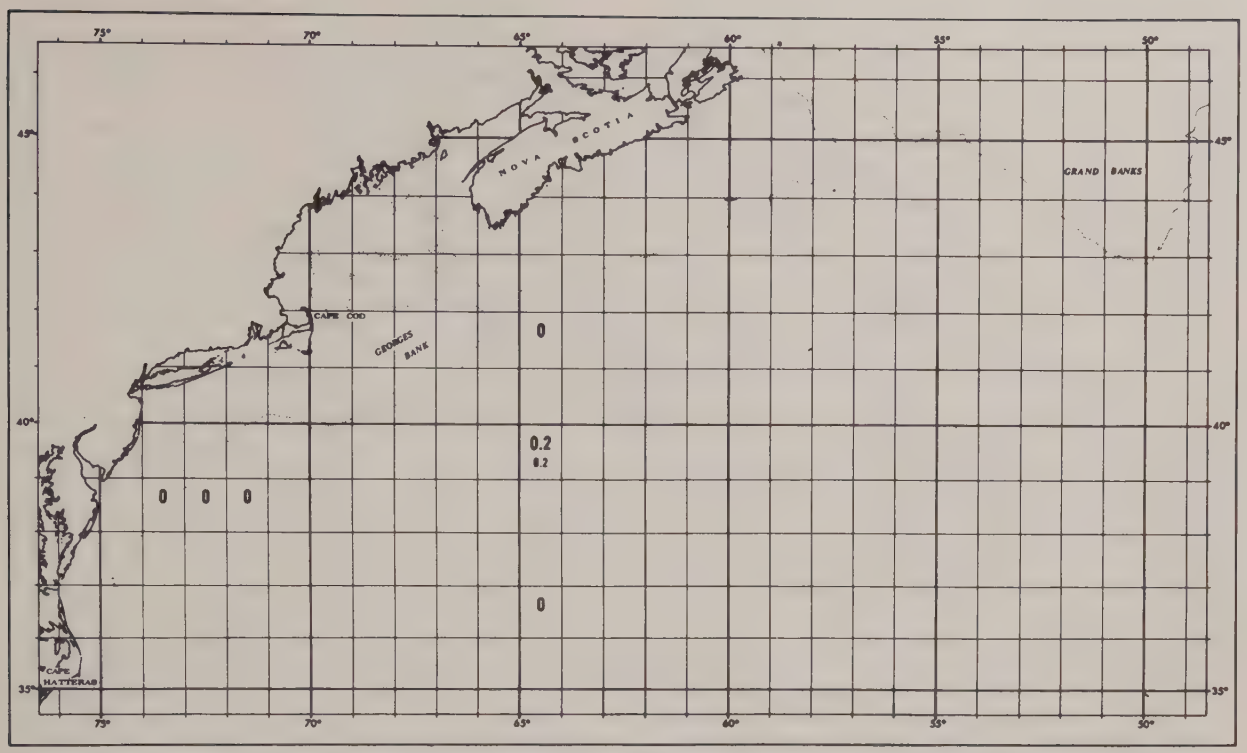

Figure 62.--Number of bigeye tuna caught in August per 100 hooks (average and maximum) within each 1° latitude and longitude square.

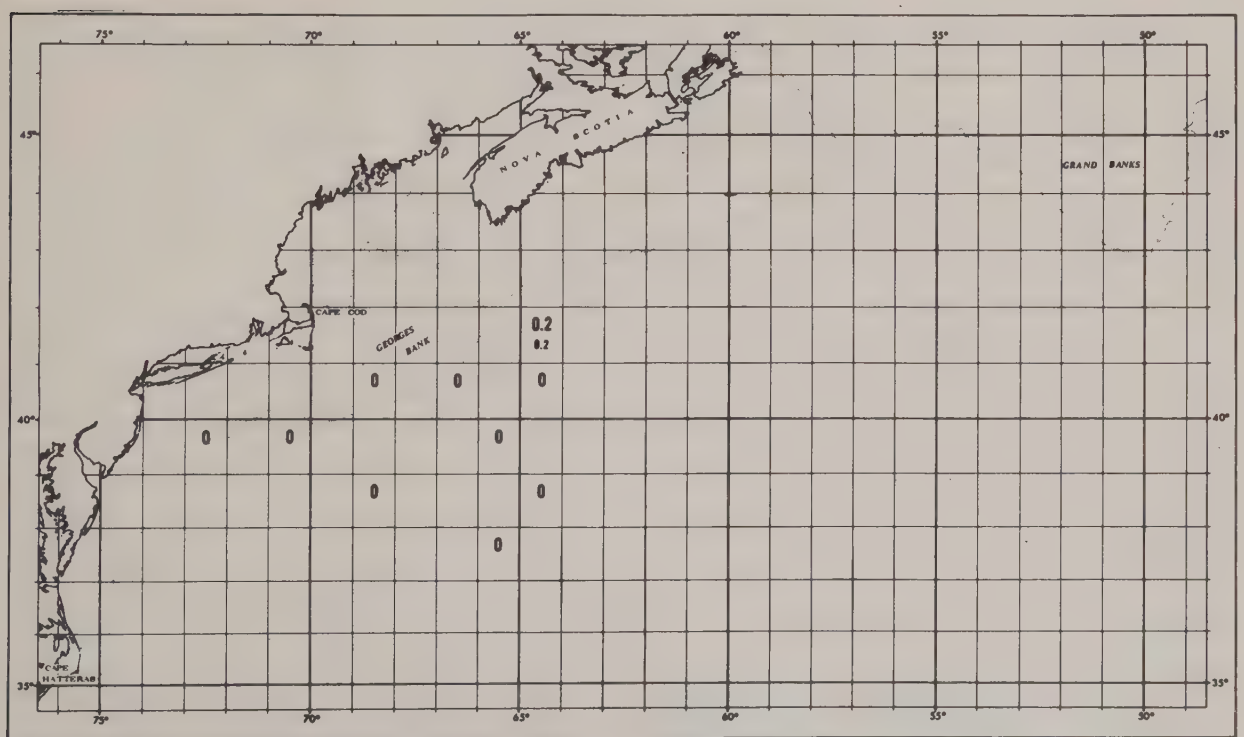

Figure 63.--Number of bigeye tuna caught in September per 100 hooks (average and maximum) within each 1° latitude and longitude square.

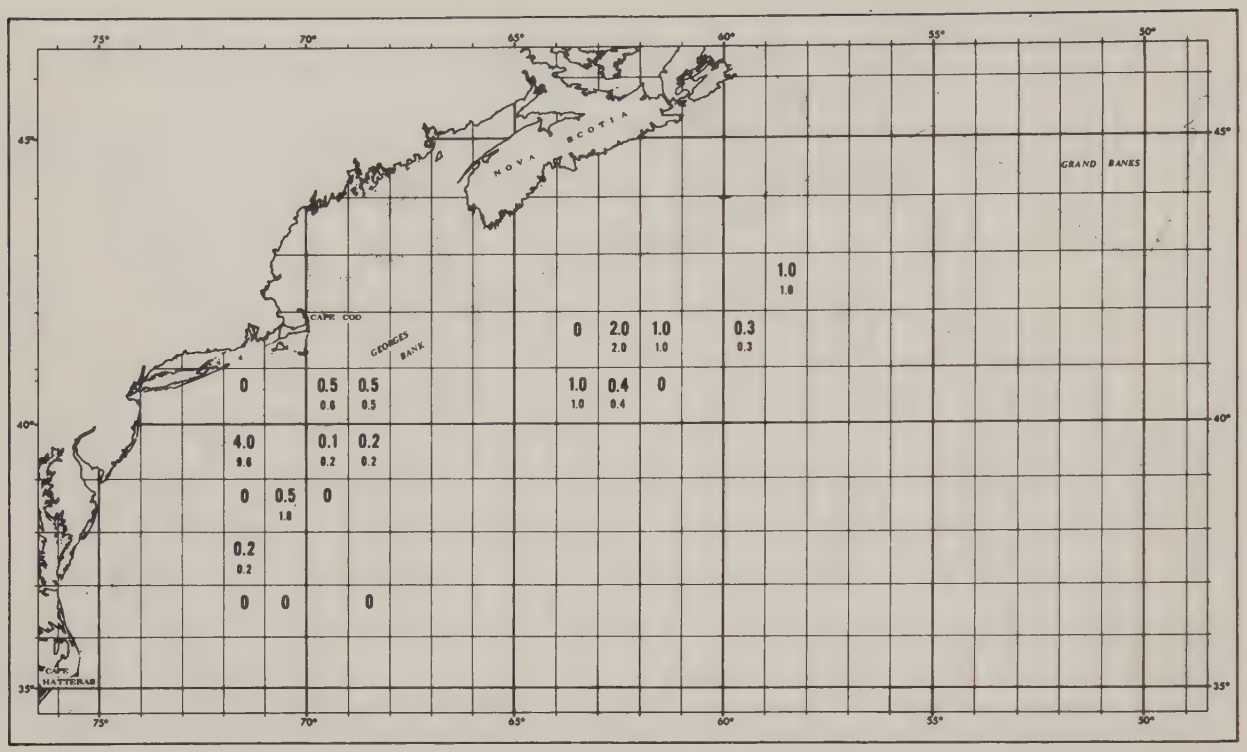

Figure 64.--Number of bigeye tuna caught in October per 100 hooks (average and maximum) within each 1° latitude and longitude square.

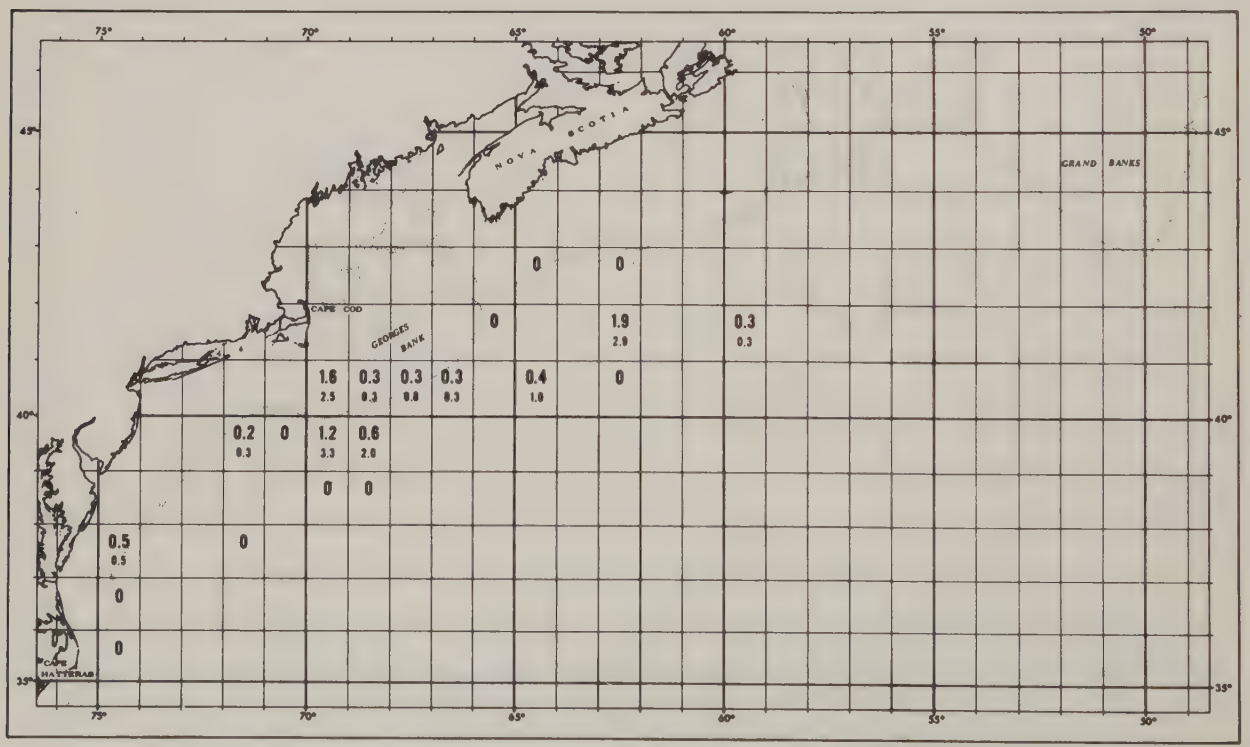

Figure 65.--Number of bigeye tuna caught in November per 100 hooks (average and maximum) within each 1° latitude and longitude square.

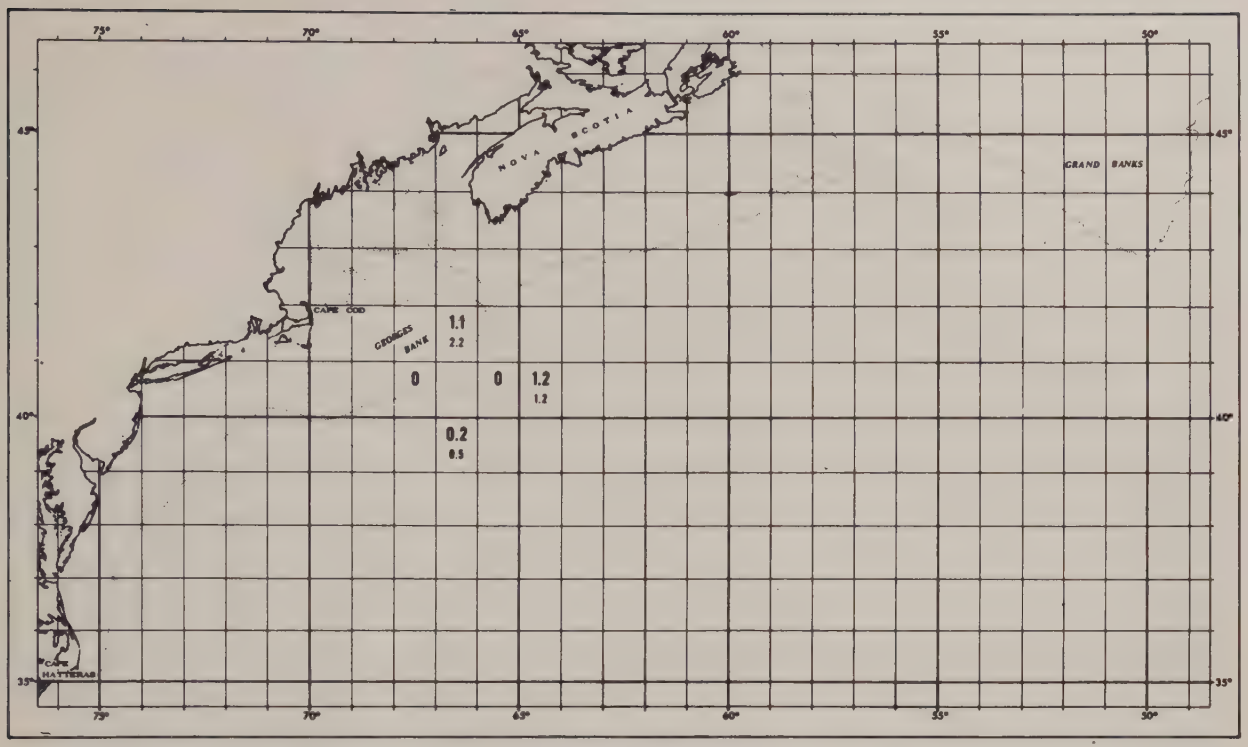

Figure 66.--Number of bigeye tuna caught in December per 100 hooks (average and maximum) within each 1° latitude and longitude square.

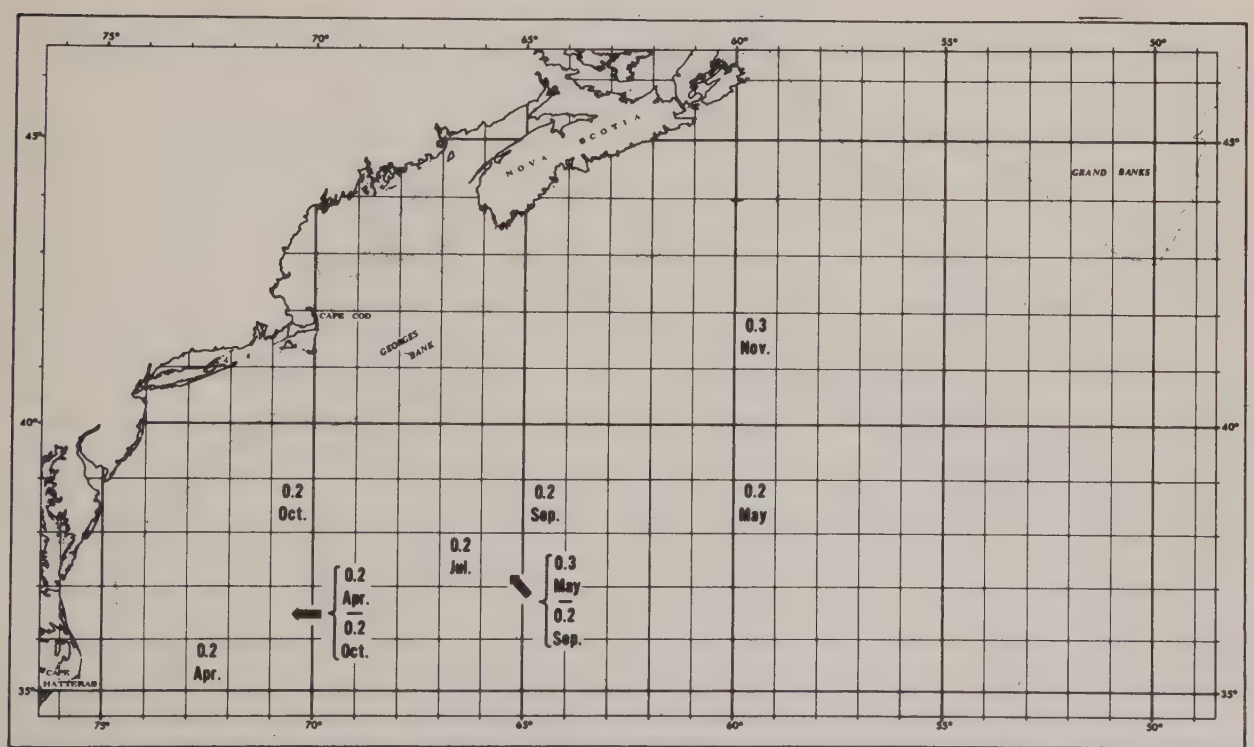

Figure 67.--Number of skipjack tuna caught in various months per 100 hooks (maximum) within each 1° latitude and longitude square.

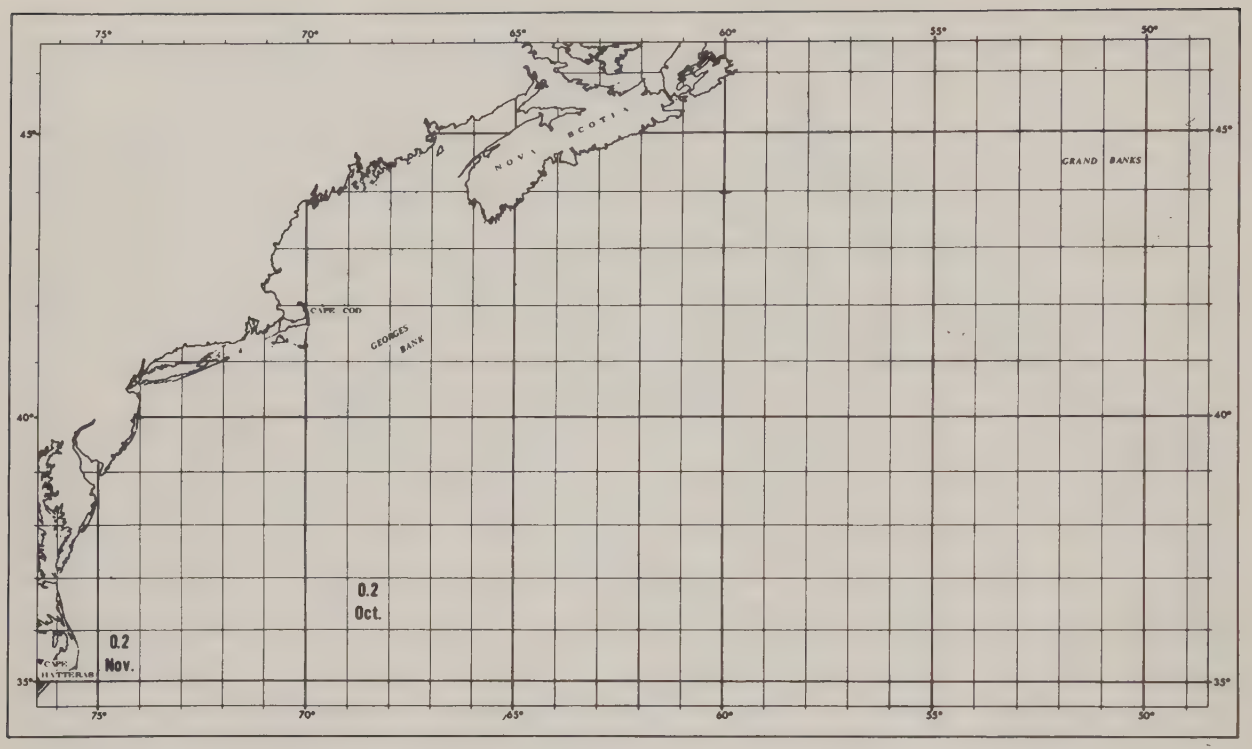

Figure 68.--Number of blackfin tuna caught in various months per 100 hooks (maximum) within each 1° latitude and longitude square.

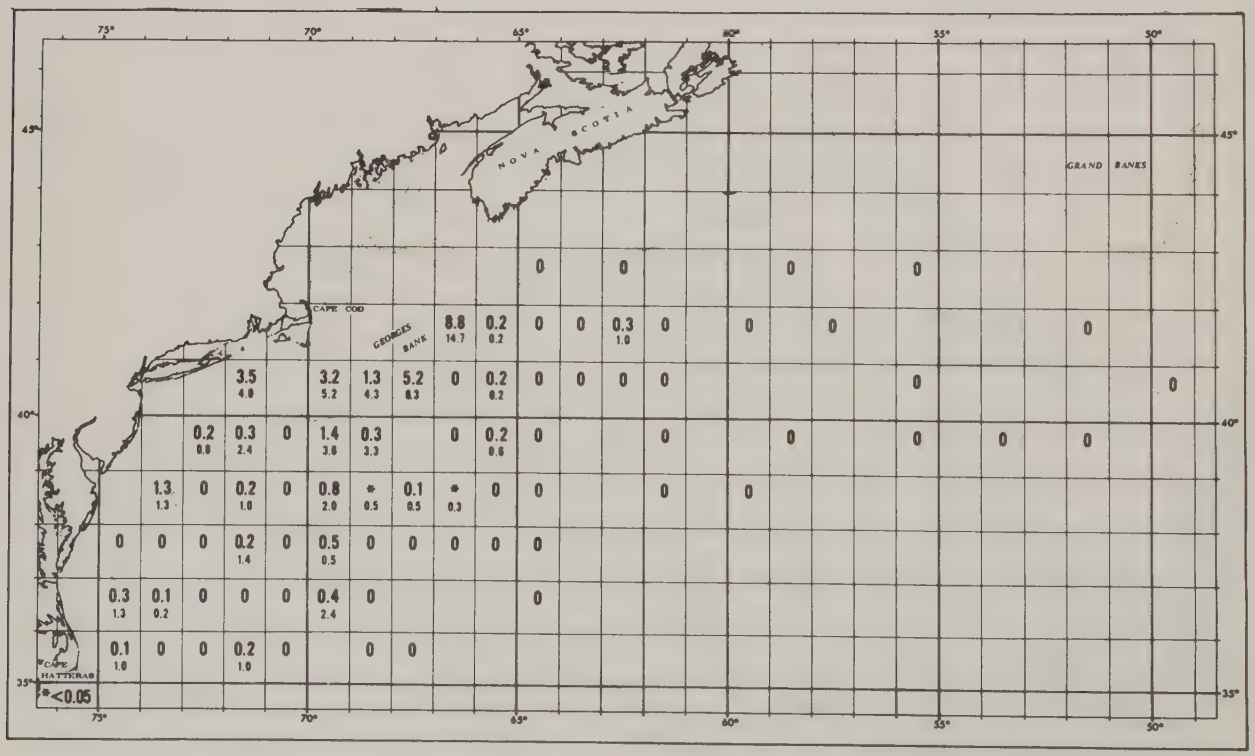

Figure 69.--Number of swordfish caught per 100 hooks (average and maximum) within each 1° latitude and longitude square.

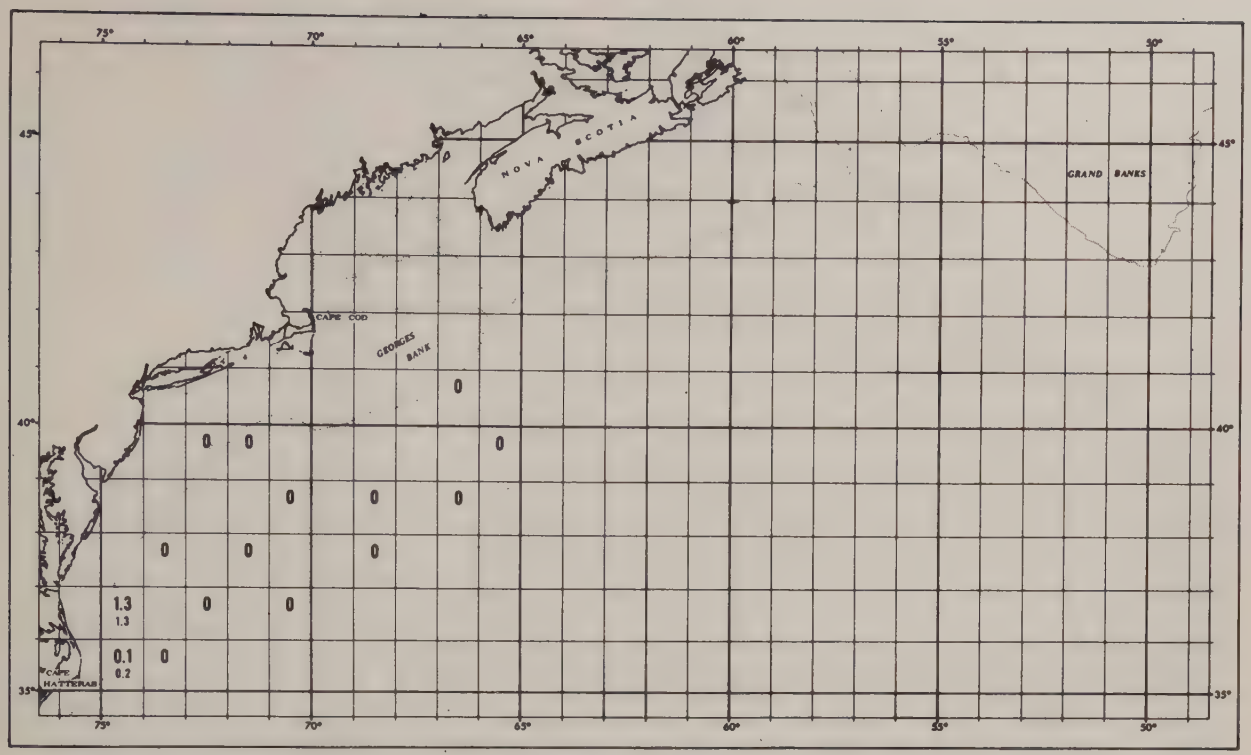

Figure 70.--Number of swordfish caught in January per 100 hooks (average and maximum) within each 1° latitude and longitude square.

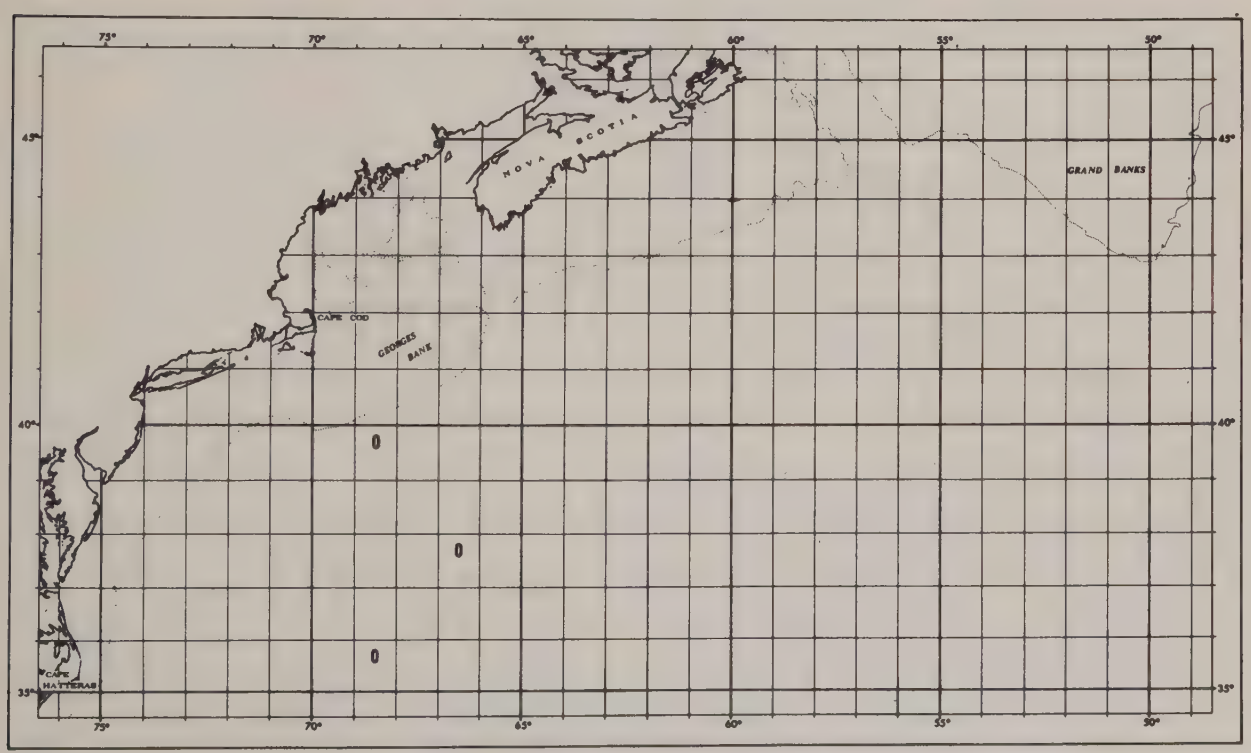

Figure 71.--Number of swordfish caught in February per 100 hooks (average and maximum) within each 1° latitude and longitude square.

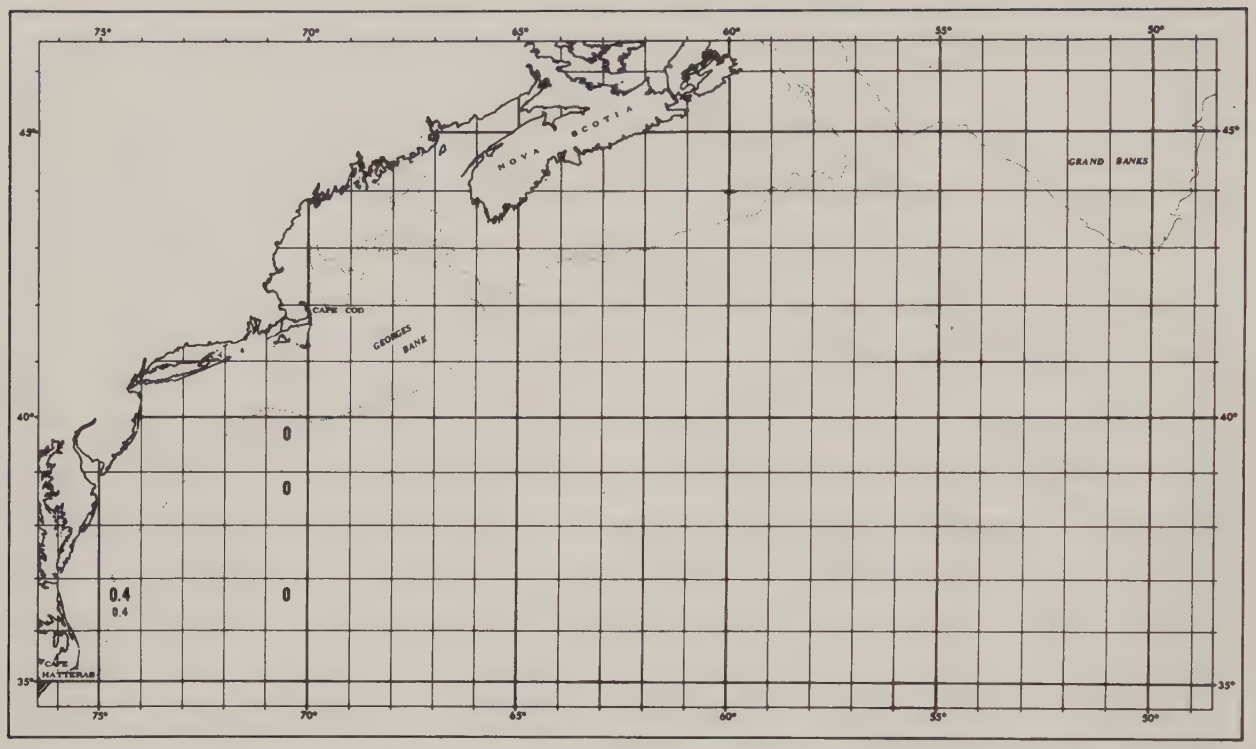

Figure 72.--Number of swordfish caught in March per 100 hooks (average and maximum) within each 1° latitude and longitude square.

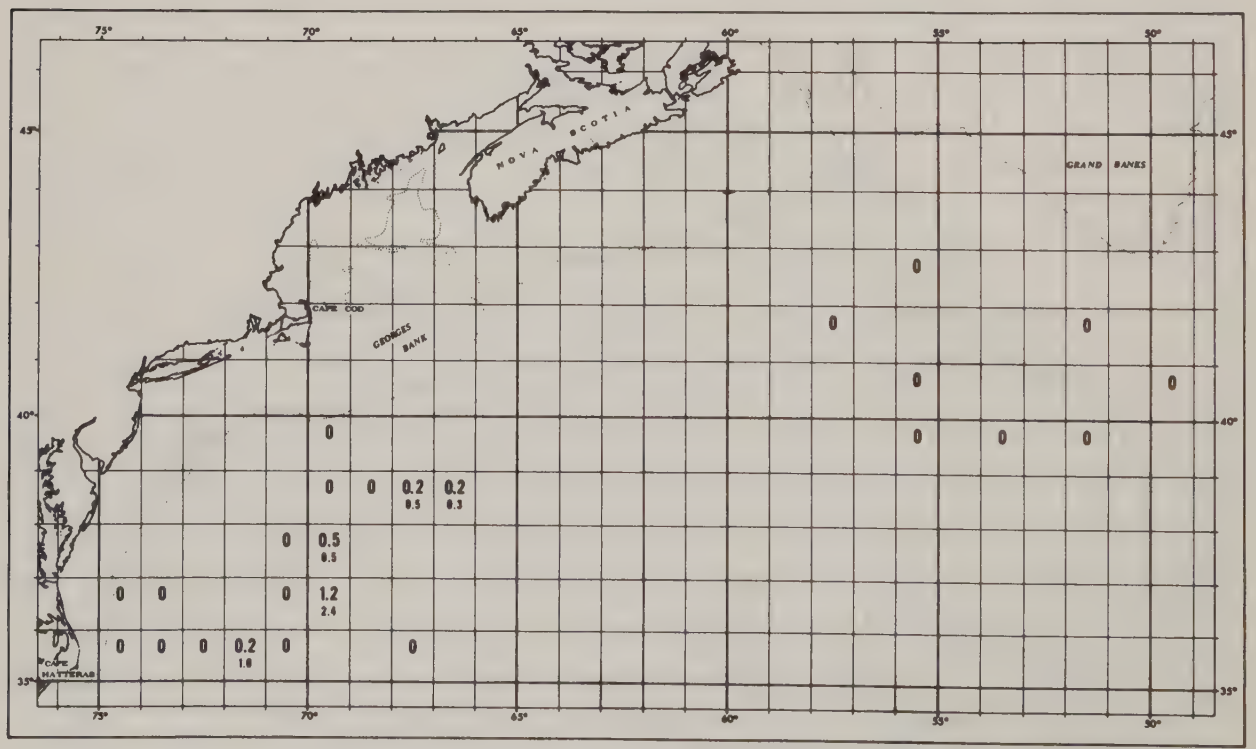

Figure 73.--Number of swordfish caught in April per 100 hooks (average and maximum) within each 1° latitude and longitude square.

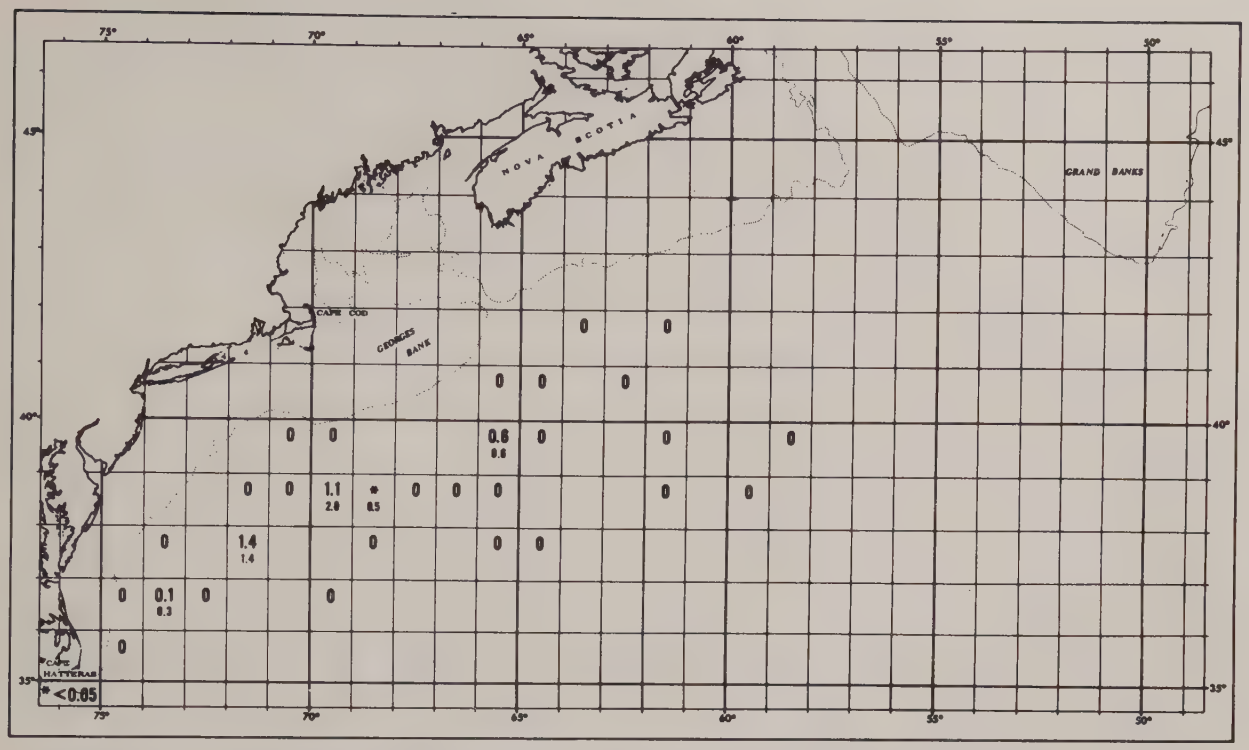

Figure 74.--Number of swordfish caught in May per 100 hooks (average and maximum) within each 1° latitude and longitude square.

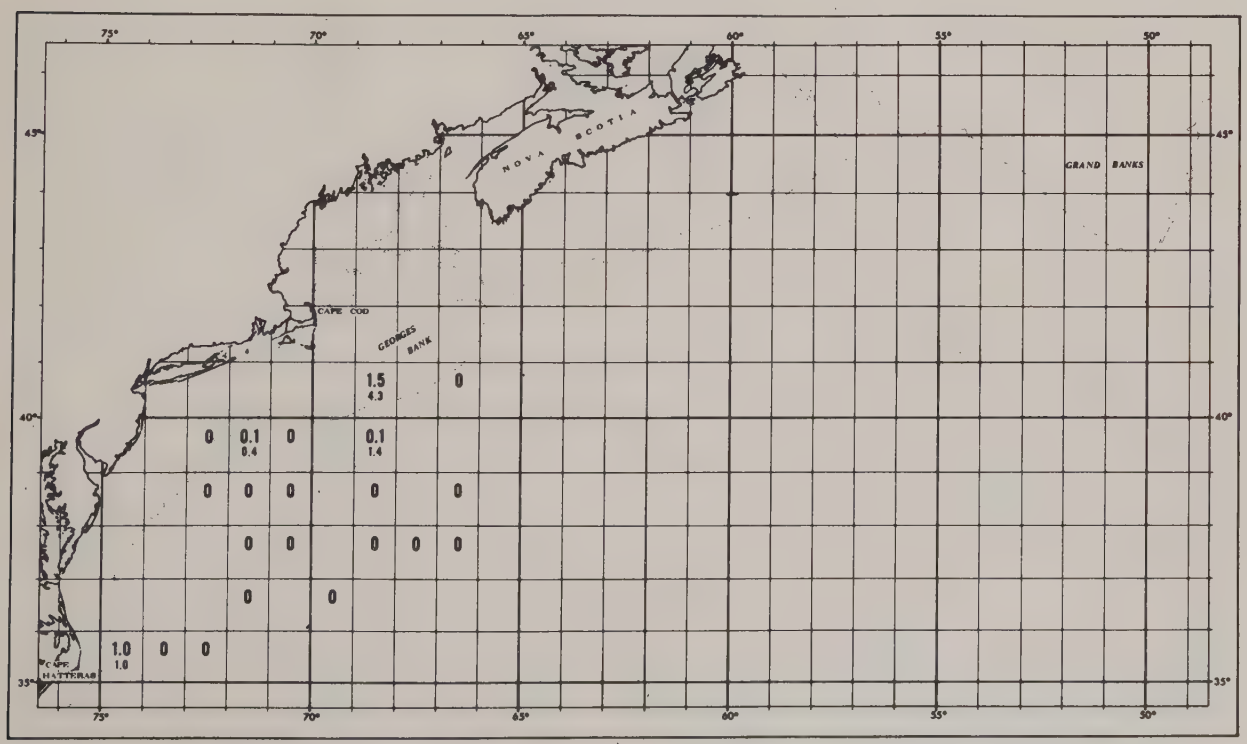

Figure 75.--Number of swordfish caught in June per 100 hooks (average and maximum) within each 1° latitude and longitude square.

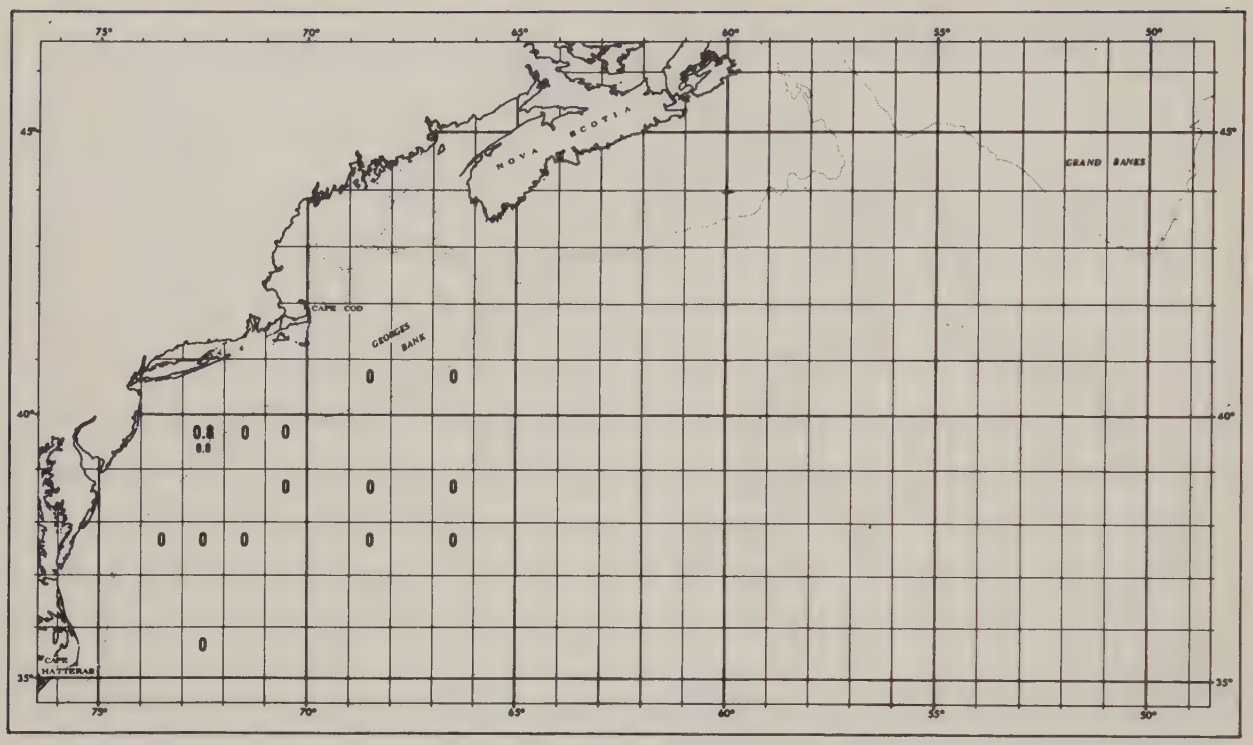

Figure 76.--Number of swordfish caught in July per 100 hooks (average and maximum) within each 1° latitude and longitude square.

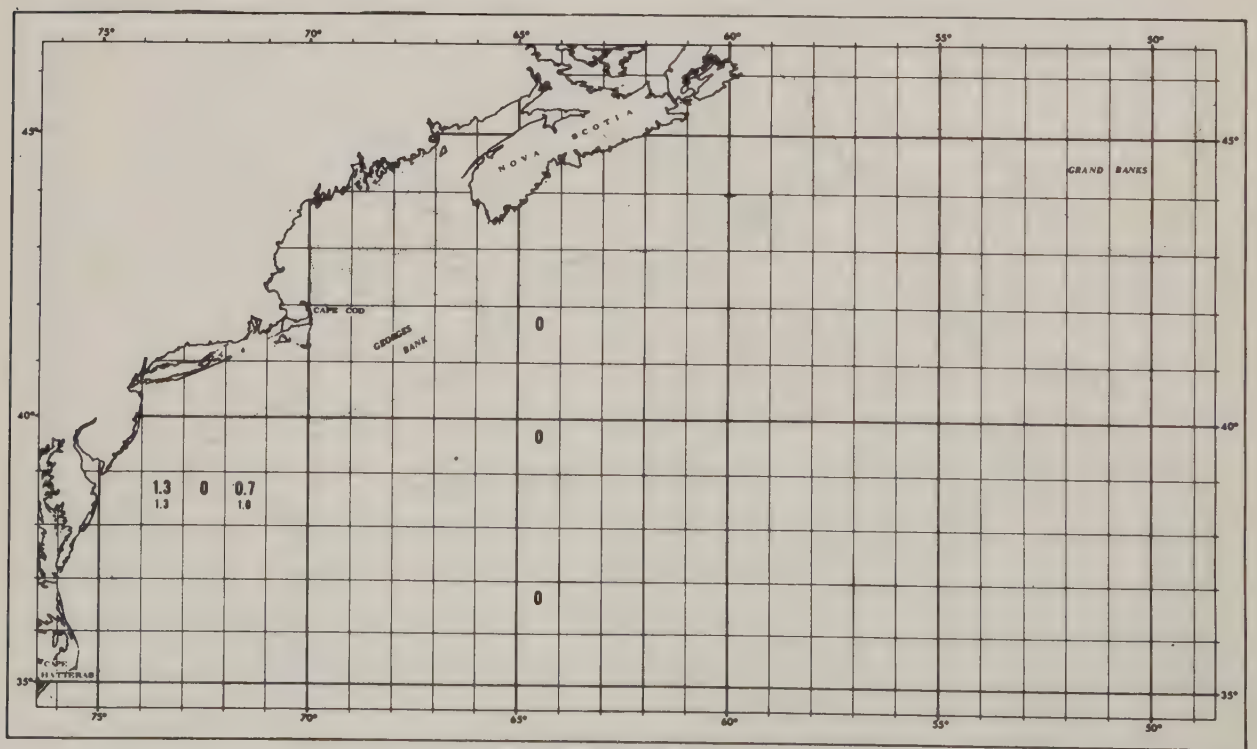

Figure 77.--Number of swordfish caught in August per 100 hooks (average and maximum) within each 1° latitude and longitude square.

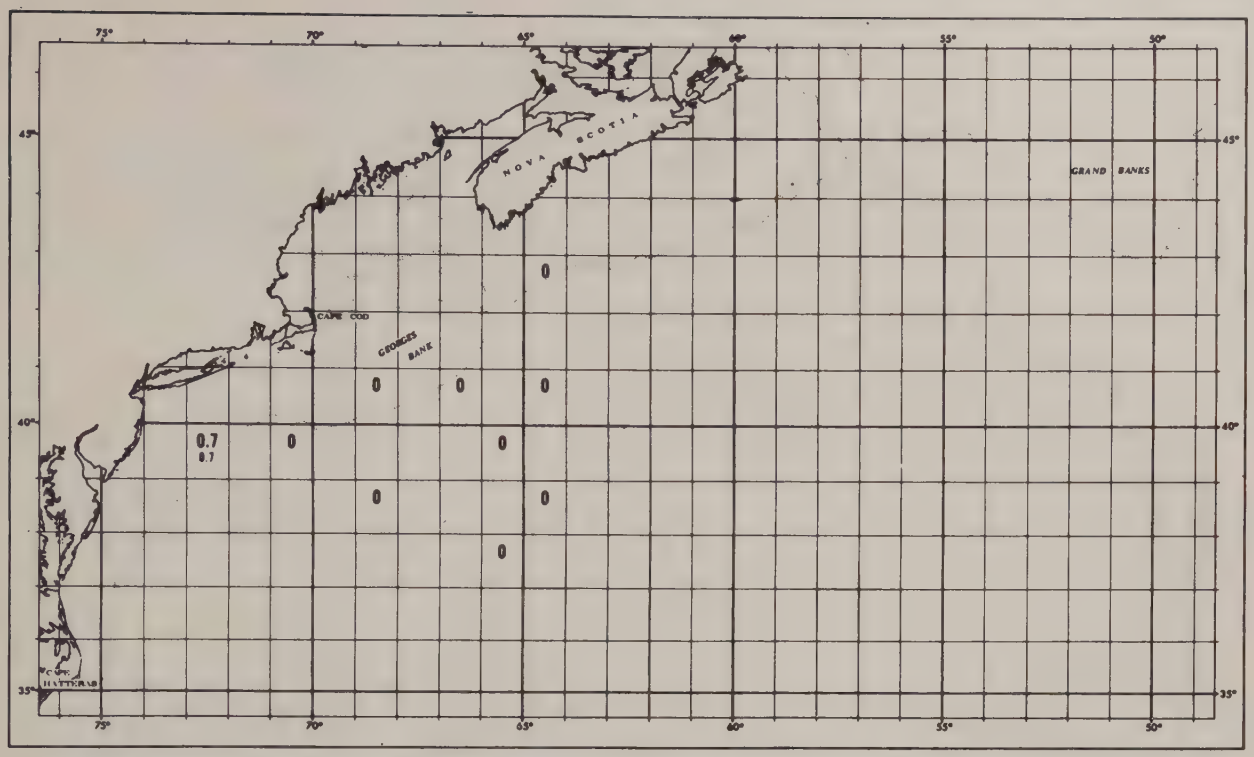

Figure 78.--Number of swordfish caught in September per 100 hooks (average and maximum) within each 1° latitude and longitude square.

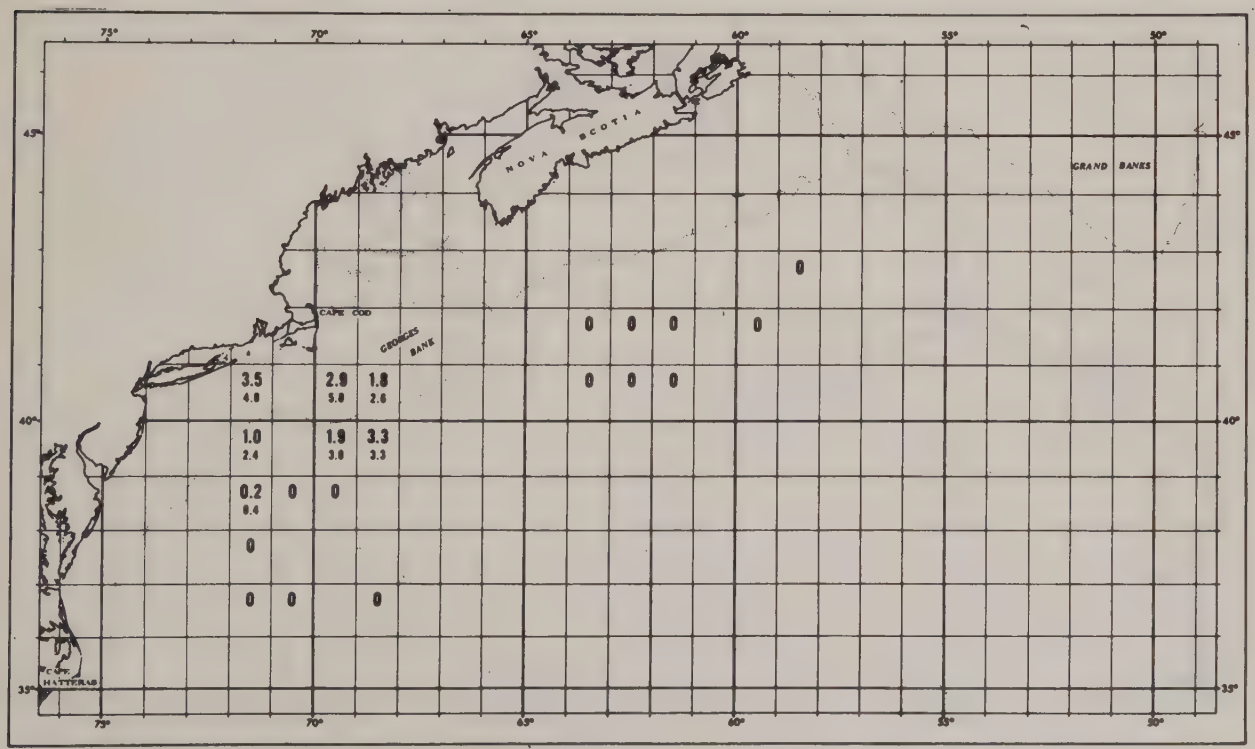

Figure 79.--Number of swordfish caught in October per 100 hooks (average and maximum) within each 1° latitude and longitude square.

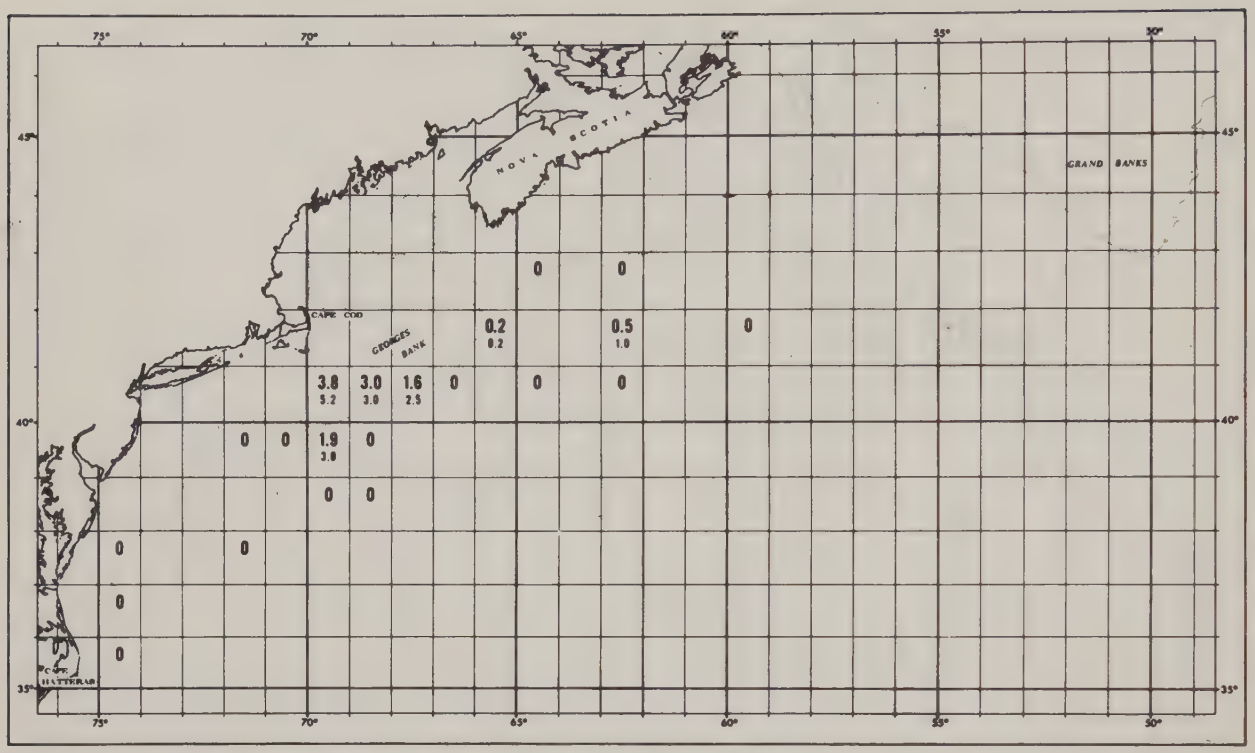

Figure 80.--Number of swordfish caught in November per 100 hooks (average and maximum) within each 1° latitude and longitude square.

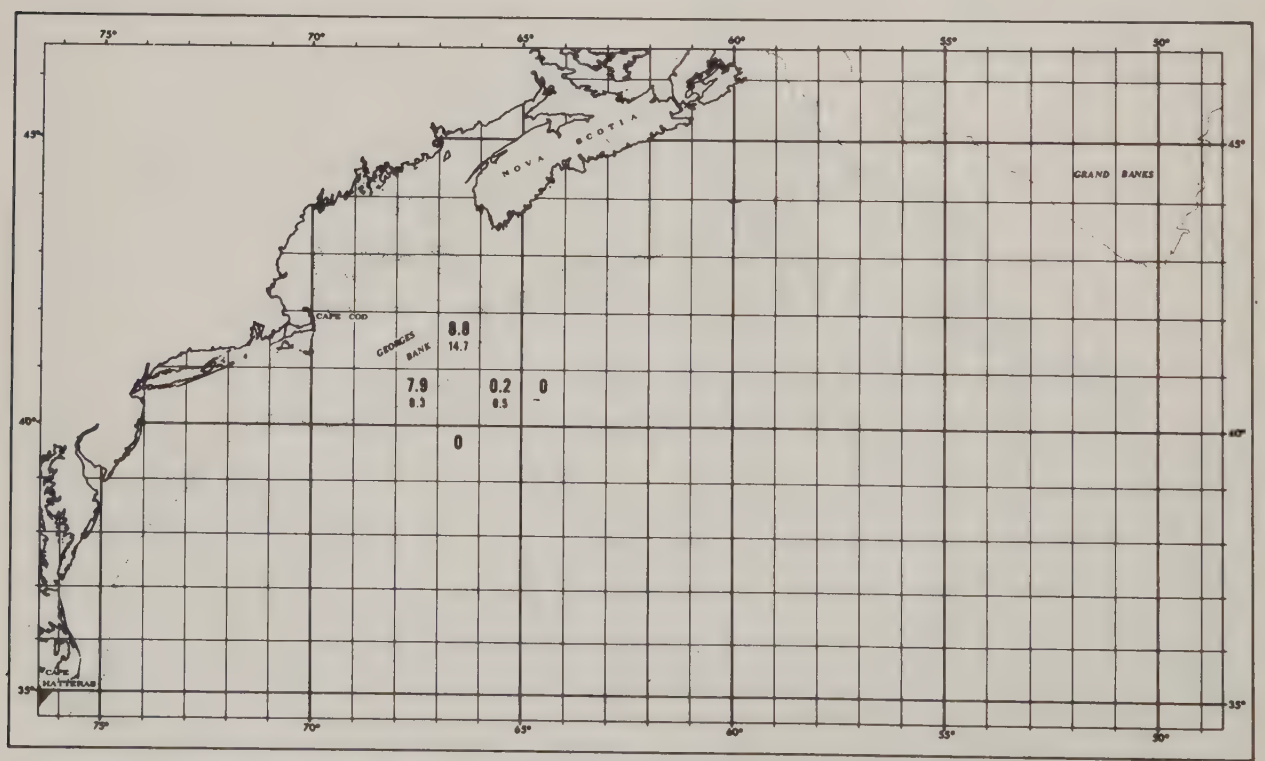

Figure 81.--Number of swordfish caught in December per 100 hooks (average and maximum) within each 1° latitude and longitude square.

GPO 918-217

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As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States--now and in the future.

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